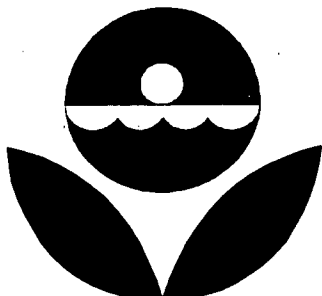


AR5044



*United States
Environmental Protection Agency
Region IX*

**Remedy Proposed Plan
for
Dual Site
Groundwater Operable Unit

Montrose and Del Amo
Superfund Sites

Technical and Expanded Version**

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June 1998*

An abbreviated fact sheet version of this document is available upon request.

Proposed Plan: Dual Site Groundwater Operable Unit
Montrose and Del Amo Sites
Technical and Expanded Version

Contents

Introduction	1
SECTION 1: Context of This Action	3
SECTION 2: Overview of Proposed Remedy	4
SECTION 3: Site Background, Sources, and the Joint Site	6
Montrose Chemical Corporation Site	6
The Del Amo Site	7
Other Contaminant Sources and the Term "Joint Site"	8
SECTION 4: Extent and Distribution of Contamination And Computer Modeling Effort	10
Non-aqueous Phase Liquids (NAPL)	10
Generalized Dissolved Contaminant Distributions	12
Conventions for Dividing the Contamination into "Plumes"	13
Presence of and Potential for Reliance on Monitored Intrinsic Biodegradation	14
Computer Modeling Effort and Plume Interactions	16
SECTION 5: Land Use and Groundwater Use	19
Land Use and Zoning	19
Water Use and Designations, and Why is EPA Concerned?	19
SECTION 6: Groundwater-Related Risks	21
SECTION 7: Proposal for Technical Impracticability Waivers	24
Summary of Why NAPL Areas Cannot Be Restored to Drinking Water Standards	25
Proposed Location and Size of the TI Waiver Zone	26
Benzene and TCE Plumes in the UBF and MBFB Sands	26
Benzene and TCE Plumes in the MBFC Sand	26
Chlorobenzene Plume	28
Summary of Proposed TI Waiver Location and Size	28
SECTION 8: Treatment Trains and Treated Water Discharge	28

SECTION 9: Alternatives Considered	31
Common Elements to All Alternatives (Other Than the No Action Alternative)	31
Approach to the TCE Plume	33
Table of Alternatives	36
SECTION 10: Summary of Evaluation of Alternatives	38
Effect of Long Remedial Time Frames	38
Alternative 1	39
Alternative 2	39
Alternative 3	40
Alternative 4	40
Alternative 5	41
SECTION 11: Rationale for EPA's Preferred Alternative	41
General Rationale	41
Rationale for Chlorobenzene Plume	43
Rationale for the Benzene Plume	43
Proposal for p-CBSA	45
Finalizing of the Del Amo Waste Pits ROD	45
<u>Opportunities for Public Involvement</u>	<u>46</u>

**REMEDY PROPOSED PLAN:
DUAL SITE GROUNDWATER OPERABLE UNIT
MONTROSE AND DEL AMO SUPERFUND SITES
(Technical and Expanded Version)**

An abbreviated fact sheet version of this proposed plan is also available

This proposed plan announces the U.S. Environmental Protection Agency's (EPA) preferred remedial alternative for the groundwater at the Montrose and Del Amo Superfund sites. As discussed below, EPA is requesting written and oral comments on this proposed plan. The information EPA considered in this process is available to the public at the Torrance and Carson Public Libraries.

The purpose of this proposed plan is to provide specific information about the groundwater contamination and the remedial alternatives EPA is considering, to assist the public in providing its comments. Publication of this proposed plan fulfills the requirements of Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), and serves as a companion to the remedial investigation reports, Joint Groundwater Feasibility Study (JGWFS) report, and the administrative record file upon which this proposed remedy is based. EPA's proposed remedy is preliminary and a final decision will not be made until EPA considers all pertinent comments. The remedy selected by EPA in the final ROD could differ from the preferred remedial alternative presented in this proposed plan, based on EPA's responses to comments it receives during the public comment period.

EPA has produced two versions of this proposed plan. This technical and expanded version is longer, provides more detail, and uses more technical language. The general fact sheet version of this proposed plan, available upon request, provides more of an overview, explains possibly unfamiliar concepts, and uses less technical language than this version. This technical and expanded version assumes that the reader has some basic familiarity with terms and concepts commonly used in hydrology, geology, contaminant fate and transport, and risk assessment. EPA considers both documents together as the proposed plan for this proposed remedial action. Both versions are intended to aid the public in commenting on EPA's proposed remedy, the remedial investigation documents, and the JGWFS. While this technical and expanded version contains many details which may be in EPA's Record of Decision (ROD) for this remedy, it should not be considered a draft ROD.

EPA is opening a 30-day public comment period in association with the release of this proposed plan. The exact dates of the opening and close of the public comment period appear in the general fact sheet version of the proposed plan. EPA may extend the public comment period by up to an additional 30 days, if it receives a request to do so. Requests for a 30-day extension must be received in writing by the date indicated in EPA's general fact sheet version of the proposed plan (address for requests shown at end of this document).

EPA will hold a public meeting pertaining to this proposed plan during the public comment period. In the public meeting EPA will explain the proposal, solicit comments and answer questions about the Superfund sites. The date, time, location, and a description of this meeting are discussed in EPA's general fact sheet version of the proposed plan, which announces the meeting.

You may provide EPA with comments on this proposed plan and preferred remedy at the meeting, or in writing (see the end of this document for address information). EPA will formally address pertinent comments received during the comment period in a response summary issued with EPA's Record of Decision.

EPA Region IX, San Francisco, is the lead agency for this action. In preparing this Proposed Plan, the RI documents and the JGWFS, EPA has consulted with its counterparts at the California Department of Toxic Substances Control, and the California Regional Water Quality Control Board, Los Angeles Region.

The following five documents provide crucial information for this proposed plan:

1. *Final Remedial Investigation Report for the Montrose Site; Los Angeles, California;* May 18, 1998; originally prepared by Montrose Chemical Corporation of California and Revised by U.S. Environmental Protection Agency, Region IX. 2 volumes.
2. *Final Groundwater Remedial Investigation Report; Del Amo Study Area;* May 15, 1998; prepared by Dames & Moore for the Shell Oil Company and The Dow Chemical Company. 3 volumes.
3. *Final Joint Groundwater Feasibility Study for the Montrose and Del Amo Sites; Los Angeles, California;* May 19, 1998; prepared by CH2M Hill for the U.S. Environmental Protection Agency, Region IX. 1 volume.
4. *Joint Groundwater Risk Assessment; Montrose and Del Amo Sites; Los Angeles County, California;* February 1998; prepared by McLaren Hart for the Montrose Chemical Corporation, and Dames & Moore for the Shell Oil Company and The Dow Chemical Company. 1 volume.
5. *Supplement to the Joint Groundwater Risk Assessment for the Montrose and Del Amo Sites; Los Angeles, California;* May 18, 1998; prepared by CH2M Hill for the U.S. Environmental Protection Agency, Region IX. 1 volume.

All of these documents appear in EPA's administrative record which can be viewed at the

Torrance and Carson public libraries, and at EPA's Regional Office in San Francisco.

SECTION 1: Context of This Action

This document provides a summary of the proposed operable unit remedy for **groundwater** and **isolation of non-aqueous phase liquids (NAPL)** at the Montrose and Del Amo Superfund sites (Figure 1). These are separate, but adjacent Superfund sites with commingled groundwater contamination. EPA found that factors related to evaluation of remedial alternatives for groundwater at these sites had become inextricably related and that actions taken for one site would, to some extent, affect actions taken at the other site. Therefore, EPA believes that it is most-appropriate to address the groundwater contamination from these two sites as a single technical problem. This remedy, when selected, will satisfy the need to address the groundwater, and the isolation and containment of groundwater contamination near NAPL, at *both* sites. EPA therefore refers to this action as a proposed **dual site operable unit remedy**. EPA anticipates that only one record of decision (ROD) will be written. Subsequent amendments to the ROD may be on either a dual-site or site-specific basis, as needed.

This action addresses only Montrose and Del Amo groundwater and isolation of contaminants near NAPL. EPA is conducting separate investigations and planning separate remedy selections for several other areas of these sites, including but not limited to surface and deep soils, surface water, neighborhood soils, and sewer systems. These activities are not covered by this document or proposed remedy.

This proposal represents the first of two phases for groundwater and NAPL at these sites. This phase solely addresses remedial actions for the dissolved phase, including isolating NAPL by keeping dissolved contaminants in the vicinity of NAPL from escaping. This phase does not address **NAPL recovery**, which refers to removing NAPL from the ground (as opposed to removing water contaminated because of NAPL). Some degree of NAPL recovery would likely enhance the long-term effectiveness and protectiveness of the remedy. Therefore, EPA, in conducting the analysis of alternatives according to the NCP nine criteria in this proposed plan, assumes that NAPL recovery will occur in a later phase. Separate site-specific feasibility studies are presently examining whether and to what degree NAPL recovery would be practicable and effective. Whether and to what extent NAPL recovery will occur will be determined and specified in later ROD amendments, which will represent the second phase of this remedy.

SECTION 2: Overview of Proposed Remedy

The groundwater at the Montrose and Del Amo sites contain areas in which NAPL is present, surrounded by larger areas of dissolved phase contamination. NAPL often creates serious challenges for remedial efforts, because it dissolves enough to create very high concentrations of contaminant in groundwater, yet not enough to be readily subject to flushing and removal. NAPL can remain in the soils indefinitely and continue to feed dissolved contamination which then moves with the groundwater both by advection along the groundwater gradient, and by dispersion in directions along and perpendicular to the hydraulic gradient.

This proposed remedy establishes different remedial actions for various portions of groundwater within the Montrose and Del Amo sites. This is because (1) the nature and extent of NAPL contamination has made it necessary to address contaminated groundwater that is near NAPL differently than contaminated groundwater away from NAPL, and (2) there are physical differences among the various areas of dissolved phase contamination within the overall contaminant distribution that justify differing goals and actions. The details of these distinctions are summarized later in this document and discussed in detail in the JGWFS.

EPA proposes to utilize the approach of isolating the NAPL within a defined containment zone so that the NAPL can no longer generate dissolved contamination that would affect the portions of groundwater that lie outside and downgradient of the containment zone. All alternatives that EPA considered for this proposed remedy (except for the No Action Alternative) assume that NAPL is isolated in this way. In this document, the terms NAPL isolation zone and containment zone are synonymous.

EPA proposes to select **Remedial Alternative 4: Benzene Hybrid Containment / Chlorobenzene Plume Reduction 2**. The remedial alternatives considered are described in detail in Sections 9, 10, and 11.

If selected by the ROD, this proposed remedy would:

- 1) Isolate (contain) dissolved phase contamination in zones in which NAPL occurs, indefinitely. The containment of the NAPL zone would be effected by hydraulic extraction for certain specific areas of groundwater, and by reliance on monitored intrinsic biodegradation for other specific areas of groundwater. These proposed groundwater areas are defined later in the document.
- 2) Based on technical impracticability, waive applicable or relevant and appropriate requirements (ARARS), which require cleanup of in-situ groundwater to drinking water standards, for a specific zone of groundwater. The size and shape of the proposed zone in

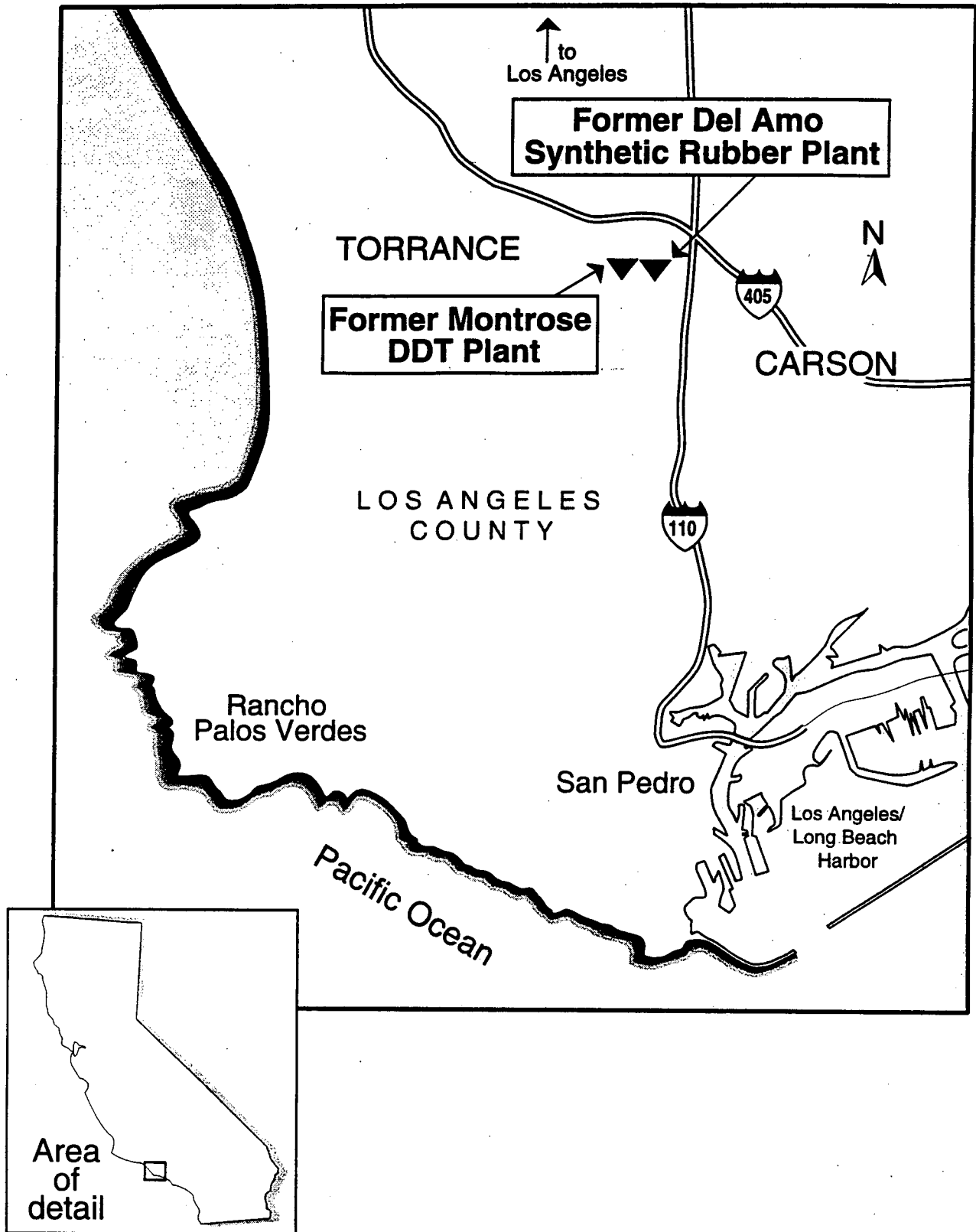


Figure 1: Site map



Montrose and Del Amo Superfund Sites
Dual Site Groundwater Operable Unit Proposed Plan
Technical and Expanded Version
U.S. EPA, Region 9, June 1998

which the TI waiver would apply (TI waiver zones, or NAPL isolation zones) are defined and justified in Appendix E of the JGWFS and summarized in Section 7 of this document. EPA believes it is technically impracticable to restore water in this zone to drinking water standards.

- 3) Restore the dissolved phase contamination *outside* the NAPL isolation zone to drinking water standards in a reasonable time frame and with significant early time performance. Specifically, this would be effected by hydraulic extraction at a rate of approximately 700 gallons per minute, *and* would be predicted to remove (when simulated by an EPA-approved computer model) at least 33% of the volume of this contamination in 15 years, 66% in 25 years, and 99% in 50 years. It is recognized that computer models have limitations which may underestimate the actual cleanup time.
- 4) Limit adverse migration of NAPL (residual phase) contaminants in the course of the remedial effort.
- 5) Limit adverse migration of existing contamination in ways which may lengthen the remedial action, result in a greater potential risk, or cause spreading of the contamination.
- 6) Discharge roughly 95% of the treated water by aquifer reinjection, with the purpose of providing hydraulic control and enhancing hydraulic flushing. Approximately 10% of the treated water would be discharged to the storm drain. The basis for this is further described later in the document.
- 7) Continually and perpetually monitor the contamination so as to evaluate concentrations, gradients and water levels, movement of contaminants, verify cleanup and containment, confirm the effectiveness of intrinsic biodegradation in areas where it is relied upon, and ensure that the remedy is fully protective of human health and the environment.
- 8) Acquire additional field data, including monitoring well data, as required.
- 9) To the extent reasonably possible, impose institutional controls (existing legal and regulatory authorities) to prohibit groundwater use in currently contaminated groundwater (EPA does not have control over the exercise or continued existence of many of these authorities; therefore they are considered an enhancement, rather than main component, of this proposed remedy).
- 11) Restore the usability of the groundwater resource for potable purposes outside the NAPL zones.

In evaluating five possible alternatives, EPA applied the nine selection criteria from the Superfund regulations, the National Contingency Plan, or NCP. It is assumed the reader of this technical and expanded version is familiar with these criteria. These appear in EPA's general fact sheet version of the proposed plan, in the JGWFS, in the NCP, and in EPA's *Guidance on Conducting Remedial Investigations and Feasibility Studies*.

With this proposed remedy, EPA is also proposing to finalize the portion of the Del Amo Waste Pit remedy that EPA had designated as interim when it issued its Record of Decision (ROD) for that remedy in 1997.

SECTION 3: Site Background, Sources, and the Joint Site

Montrose Chemical Corporation Site

Montrose Chemical Corporation operated a technical grade dichloro-diphenyltrichloroethane (DDT) pesticide manufacturing plant in Los Angeles, California from 1947 to 1982. The 13-acre former plant property lies just outside Torrance, in a narrow strip of the City of Los Angeles known as the Harbor Gateway. This strip extends south from the main portion of Los Angeles to give the City a jurisdictional path to the ocean.

DDT was one of the most-widely used pesticides in the world until 1972, when the use of DDT was banned in the United States for most purposes. After 1972, Montrose continued producing DDT at the former plant to be sold in other countries. In 1982-1983, the plant ceased operations, was dismantled, and all buildings were razed. Since 1985 there is a temporary asphalt covering over the former plant property, which is otherwise fenced and vacant.

During its 35 years of operation, the Montrose plant released hazardous substances, pollutants or contaminants, into the surrounding environment, including surface soils, surface drainage and stormwater pathways, sanitary sewers, the Pacific Ocean, and groundwater. The primary raw materials Montrose used for making the pesticide DDT are monochlorobenzene (hereafter, "chlorobenzene") and trichloroacetaldehyde, known as "chloral." These reacted in the presence of a powerful sulfuric acid catalyst called oleum, to produce DDT. Chlorobenzene and DDT are the primary contaminants found in the environment at the Montrose site today. DDT does not dissolve in water but will readily dissolve in chlorobenzene, which, in pure form, is a dense non-aqueous phase liquid (DNAPL).

Montrose operations included a series of trenches and an unlined waste disposal pond (impoundment) which received wastewaters, DDT, and chlorobenzene. There is also evidence it received caustic liquors and acid tars. Activities at the plant caused discharges of chemicals to

the ground surface and to the waste pond. The soils under the Central Processing Area of the former Montrose plant contain large quantities of chlorobenzene in DNAPL form. This DNAPL is a primary source of groundwater contamination.

An unwanted by-product of DDT manufacture is the highly water-soluble compound parachlorobenzene sulfonic acid, or p-CBSA. This compound was created when chlorobenzene was directly sulfonated by sulfuric acid in Montrose's operations. To EPA's knowledge, p-CBSA occurs in industry only in connection with DDT manufacture. There are no chronic toxicity data, and virtually no acute toxicity data for this compound. There are no promulgated health standards for p-CBSA, which is found extensively in groundwater.

Chapter 1 of the final Montrose RI Report (EPA, 1988) gives additional details on the Montrose operating history. See Section 4 of this proposed plan for a more-detailed discussion of contaminant distribution.

The Del Amo Site

The United States, as the War Assets Administration (this agency was succeeded by the U.S. General Services Administration [GSA]), owned and operated a synthetic rubber manufacturing facility in Harbor Gateway, between the cities of Torrance and Carson, California, beginning in 1942. The War Assets Administration held operating agreements with Shell Chemical Company, Dow Chemical Company, and several other companies, to operate the plant and to produce rubber for the United States during World War II. In 1955, Shell purchased the facility and began operating it directly. The site did not take on the name "Del Amo" until later. The Del Amo synthetic rubber plant covered 270 acres, roughly 20 times the size of the neighboring Montrose facility. It operated until 1972, at which time operations ceased, the plant was dismantled, and the plant buildings were razed. The plant property has been entirely redeveloped with light industrial and commercial enterprises.

The Del Amo plant had three sub-plants within it, commonly called "plancors." The styrene and butadiene plancors produced styrene and butadiene, respectively, and the rubber plancor combined styrene and butadiene chemically to make synthetic rubber. Of the three plancors, it has been shown that the majority of the contamination (there are exceptions) is found in the area of the former styrene plancor, in which large quantities of liquid benzene and ethylbenzene were stored and used. Over the years of its operation, the Del Amo plant released hazardous substances, pollutants, or contaminants into the surrounding environment. There are eleven areas at the former Del Amo plant, nine of which are in the styrene plancor, which are under investigation as sources of benzene NAPL to the subsurface. In four of these areas, the evidence of NAPL is conclusive or very high. In the other areas, the evidence is strong, but slightly less. These remain under further investigation by Shell Oil Company and Dow Chemical Company.

All of these NAPL sources lie within or very close to the distribution, or "footprint", of the observed groundwater contamination. The "MW-20 area," so-named because it is near monitoring well MW-20, lies near a former benzene storage tank of at least a half-million gallons capacity. South of MW-20 is a tank farm which stored benzene and ethylbenzene.

At the southern boundary of the former Del Amo plant property are the unlined "waste pits," in which both tarry and aqueous wastes were discharged, including wastes containing benzene, ethylbenzene, and naphthalene. The waste pits also received surfactants which may account for unusual contaminant migration patterns under the pits. While the pits have a thick soil cover, there is still 55,000 cubic yards of viscous waste remaining in the pits underground. In September 1997, EPA signed a ROD for an operable unit remedy for the waste pits. Under the selected remedy, an engineered impervious cap complying with requirements of the Resource, Conservation and Recovery Act (RCRA) will be constructed over the waste, which will be left in place. In addition, soil vapor extraction (SVE) will be performed on the soils under the waste. EPA considers the SVE system to be an interim source control measure pending the selection of a groundwater remedy.

On the eastern end of the former rubber plant lies another area with extensive benzene contamination in soils and groundwater. Plant history indicates the presence of laboratories, above-ground pipelines, chemical storage and processing areas, and wastewater treatment areas. All of these have been the subject of the Superfund remedial investigation effort, and some remain under investigation. Enough information is known, however, to propose a remedy for groundwater in this area.

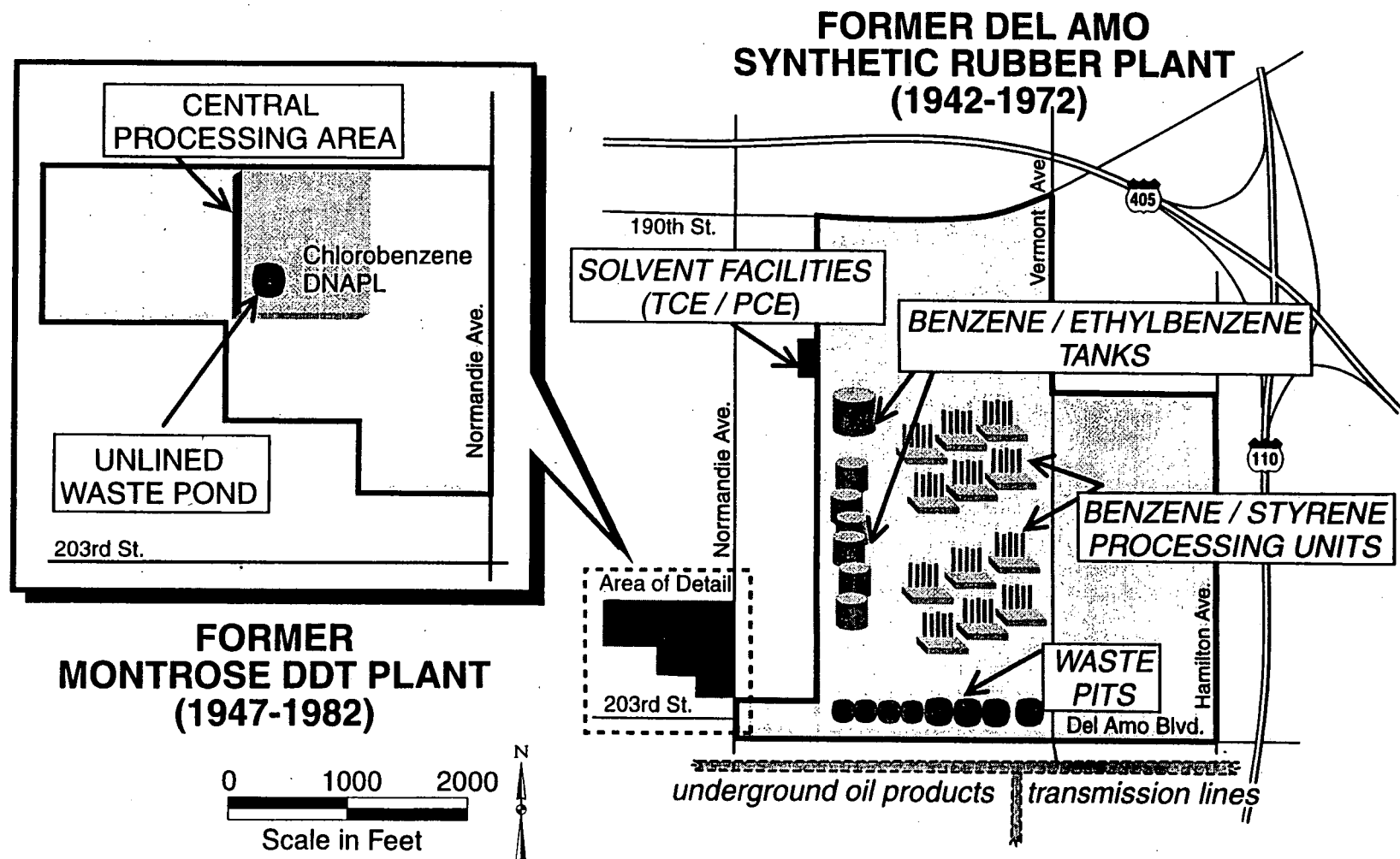
In the southeastern area of the former Del Amo plant site, directly east of the waste pits, is another area with confirmed benzene NAPL contamination. The source of this benzene is not immediately apparent, though there was a major pipeline in this area while the plant was in operation.

Most major sources of benzene at the former Montrose and Del Amo facilities, as well as minor sources between these major sources, are shown on Figure 2. Section 2 of the JGWFS (1988), the Montrose Remedial Investigation Report (1988), and the Del Amo Groundwater Remedial Investigation Report (1988) each contain more detail on contaminant sources. See Section 4 for more details and conclusions about contaminant distributions.

Other Contaminant Sources and the Term "Joint Site"

The Montrose and Del Amo sites lie in an industrial area where multiple other sources of groundwater contamination exist. Some of these other sources will be directly affected by this

SOURCES OF CONTAMINATION



Montrose and Del Amo Superfund Sites
Dual Site Groundwater Operable Unit Proposed Plan
Technical and Expanded Version
U.S. EPA, Region 9, June 1998

Figure 2: Sources of Contamination

proposed remedial action, others will not. EPA has therefore clarified generically to what this proposed remedial action is assumed to apply. It should be noted that a Superfund site is defined as the area in which contamination has come to be located. As this changes over time, so does the size and shape of the site. In this section, EPA does not define site boundaries but rather gives general conceptual guidelines as to the area being addressed by the alternatives that have been considered.

The primary focus of this action is contamination which has emanated from the former Montrose and Del Amo plant operations. However, there is groundwater contamination from other sources which lies either entirely or mostly within the commingled contamination from these properties. The contamination from the former Montrose and Del Amo plants, and the contamination from additional sources that is commingled, or within the area that might be subject to significant hydraulic influences under the proposed remedy, are collectively referred to as "the joint site." There are other sources of groundwater contamination farther afield surrounding the Montrose and Del Amo properties that are not likely to be affected by this remedy. These are not considered to be part of the joint site for the purposes of evaluating and proposing remedial actions. Most of these are subject to remedial investigation and/or other remedial actions by the State of California.

Within the joint site, there are several actual or potential benzene sources in addition to the former Del Amo plant. One source is a series of petroleum transmission pipelines, unrelated to the former Montrose and Del Amo plants, which are used to transfer petroleum products from the port to the refineries in the area (Figure 2). There are several locations directly under these pipelines where groundwater concentrations are indicative of the likely presence of benzene NAPL and which may be related to these pipelines. The major pipelines run in an east-west direction just south of both the former Montrose and Del Amo plants. One suspect location along this pipeline is south of Montrose along the pipeline. Another location is along a north-south feeder line into the east-west transmission line, south of the Del Amo Waste Pits, near historical groundwater monitoring well P-1. NAPL has been directly observed at this location.

A potential source of benzene in groundwater near the former Montrose plant is Stauffer Chemical, which operated a chemical plant on the Montrose property that manufactured BHC (lindane), another pesticide. BHC manufacture typically requires benzene as a feedstock. A third potential source of benzene in groundwater near the former Montrose plant is the benzene that occurs in raw chlorobenzene at a rate of about 0.3%.

Additionally, there are sources within the joint site of chlorinated organic solvent contamination, primarily PCE and TCE. The concentrations of these contaminants are small in comparison to the benzene and chlorobenzene concentrations. Nonetheless, they far exceed drinking water standards. Two such sources are of particular note. The Jones Chemicals facility, immediately

south of the former Montrose plant, was known to have discharged solvents to a dry well. In addition, two facilities at the Del Amo western border handle solvents and have soils with high levels of these solvents. Figure 2 shows the latter sources of contamination. The Jones Chemicals facility is not shown on Figure 2.

SECTION 4: Extent and Distribution of Contamination

And Computer Modeling Effort

In order to understand this proposed remedy, an understanding of the distribution of contamination in each of the hydrostratigraphic units in question is crucial. The reader is referred to the remedial investigation reports and to Section 2 of the JGWFS for a complete summary of the extent and distribution of contamination. The presentation here is general. This remedy proposal defines a number of zones laterally and vertically within the groundwater, and assigns differing remedial actions to each. *It is essential that the reader read the subsection below entitled "Conventions for Dividing the Contamination into Plumes," because throughout the remainder of this document, and in the JGWFS, EPA uses a definition of the word "plume," by convention, that differs from its more common meaning.*

Driving Chemicals of Concern for Remedy Selection Purposes

Some 28 hazardous substances and pollutants or contaminants have been detected in groundwater at the joint site, including but not limited to: chlorobenzene, benzene, ethylbenzene, naphthalene, DDT, chloroform, trichloroethylene (TCE), and perchloroethylene (PCE). Of these, however, benzene, chlorobenzene and TCE are by far the most-widely distributed, consistently detected, and are found in the highest concentrations at the joint site. These chemicals also present the greatest potential toxicity. While EPA's risk assessment addressed all chemicals in groundwater, EPA's feasibility study focused on remedial actions for these three chemicals. All other chemicals in groundwater fall within the basic distributions of these three chemicals, and would be addressed by whatever remedial actions are selected for them from the range of alternatives considered in the JGWFS. The chemical p-CBSA is also present in groundwater; EPA's proposal for this contaminant is addressed separately from the other contaminants as further described in Sections 6 and 11.

The contaminant p-CBSA is also present in groundwater (see discussion of distribution later in this section). EPA's proposal for p-CBSA is handled separately from the other contaminants as further discussed in sections 6 and 11 of this proposed plan.

Non-aqueous Phase Liquids (NAPL)

The DNAPL at the Montrose site may penetrate as far as the Gage Aquifer to a depth of as much as 200 feet below ground surface. In a treatability test, DNAPL was actively pumped from the MBFB Sand (see discussion of hydrostratigraphic units, below) at rates of up to 10 gallons per day, demonstrating that there is flowable NAPL (i.e. above residual saturation levels) in some locations under the former Montrose plant property. NAPL resides in a lateral area some 1000 feet long and 600 feet wide centered on the Central Processing Area of the former plant. The total volume of NAPL is unknown, though this is not unusual at NAPL sites. Dissolved chlorobenzene has left the Montrose property and has migrated laterally up to 1.3 miles in five successively deeper aquifers (See below). Due to the extensive depth and quantity of DNAPL and other factors, EPA considers it technically impracticable to remove enough NAPL to allow for attaining drinking water standards in the groundwater in the vicinity of the DNAPL. Support for this conclusion is provided in the Joint Groundwater Feasibility Study, Appendix E, and summarized in Section 7 of this document.

To the east at the Del Amo site, there is shallower benzene LNAPL that is smeared under the water table (Figures 3 and 4). This LNAPL originally spread out and floated on the water table when the water table was lower. Then, due to adjudication of the local groundwater basin, the water table rose and overtook the LNAPL, smearing it upward. Therefore, the known benzene LNAPL under the former Del Amo plant property is now trapped in the *saturated* zone, near and under the water table.

Hydrostratigraphic Units and Groundwater Flow

As shown in Figures 3 and 4, there are seven major water-bearing units under the joint site that are currently affected by contamination. These are: the Upper Bellflower (UBF), the Middle Bellflower "B" Sand (MBFB Sand) the Middle Bellflower "C" Sand (MBFC Sand), the Lower Bellflower Aquitard (LBF), the Gage Aquifer, the Gage-Lynwood Aquitard, and the Lynwood Aquifer. The water table is inclined relative to the interface between the UBF and the MBFB Sand. Therefore, the water table occurs in the UBF at most of Del Amo, but it occurs in the MBFB Sand at Montrose. The UBF is only saturated under (most of) the former Del Amo plant - it is unsaturated under the former Montrose plant.

Because of its relatively high hydraulic conductivity, the greatest contaminant migration potential, as well as the greatest potential to apply pumping or reinjection, exists in the coarser-grained MBFC Sand, Gage Aquifer, and Lynwood Aquifer. These units typically can sustain maximum pumping of 50-100 gpm per well. The UBF and MBFB Sand are much finer-grained and can typically sustain maximum pump rates on the order of 1 gpm and 10 gpm, respectively, at the joint site. The degree of heterogeneity of the UBF and MBFB Sand is high, especially near the former Montrose plant. The State of California has classified all hydrostratigraphic units under the joint site, including the UBF and MBFB Sand, as potential drinking water sources.

The lateral hydraulic gradient of the groundwater varies locally in the upper units, but is largely consistent in the MBFC Sand and all hydrostratigraphic units beneath it. The orientation of the lateral gradient (i.e. direction of groundwater flow) in the UBF has local perturbations but is generally to the south. The gradient in the MBFB Sand is to the south to south/southeast. The gradient in the MBFC Sand, Gage, and Lynwood is to the south/southeast. The magnitude of the eastward component of the gradient vector increases slightly as the depth of the unit increases. There are also significant downward vertical gradients between all of the aquifers, except between the Gage and Lynwood Aquifers. The observed vertical gradients appear to be natural or regional and not due to local pumping. Wells were not installed in the aquitards (the LBF and the Gage-Lynwood Aquitard) in the course of the remedial investigation. Monitoring these units is extraordinarily difficult due to their low hydraulic conductivities.

Generalized Dissolved Contaminant Distributions

The distribution of contaminants is based on remedial investigation efforts performed, with EPA oversight, both by Montrose Chemical Corporation for the Montrose site, and Shell Oil Company and Dow Chemical Company for the Del Amo Site. More than 100 wells have been installed. Figure 5 shows the overlapping plumes of benzene, chlorobenzene, and TCE in the UBF, MBFB Sand, MBFC Sand, and Gage Aquifer. The superimposed icon represents the hydrostratigraphic layers in the vertical plane and serves to orient the surrounding lateral plane figures.

The dissolved benzene distribution near the NAPL sources at the former Del Amo plant tightly surrounds the NAPL (Figure 5). There are very steep concentration gradients. Concentrations of benzene up to its solubility limit, approximately 1,700,000 ppb, are present at the joint site. In contrast, the chlorobenzene downgradient of the former Montrose plant has moved about 1½ miles from the Montrose plant source in the MBFC Sand and Gage Aquifer. This contamination has traversed all of the water-bearing units above the Silverado Aquifer. Chlorobenzene is present in concentrations up to its solubility limit, near 400,000 ppb. There is benzene commingled with this large chlorobenzene distribution. In contrast to the benzene near the NAPL sources under the former Del Amo plant, the benzene that is commingled with the chlorobenzene does not exhibit steep concentration gradients at the leading (i.e. downgradient) edges of the plume, but rather a flatter and larger distribution similar to that found in the chlorobenzene plume.

TCE is present both commingled with the chlorobenzene distribution under the former Montrose plant, and commingled with the benzene distribution under the former Del Amo plant. Concentrations of TCE are present up to about 9,400 ppb at the joint site. There are fewer data available pertaining to the TCE present in the benzene near the former Del Amo plant than for the other contaminants. Additional field data about the TCE distribution will be necessary in remedial design, however, the remedial actions proposed in this plan for TCE are justified based

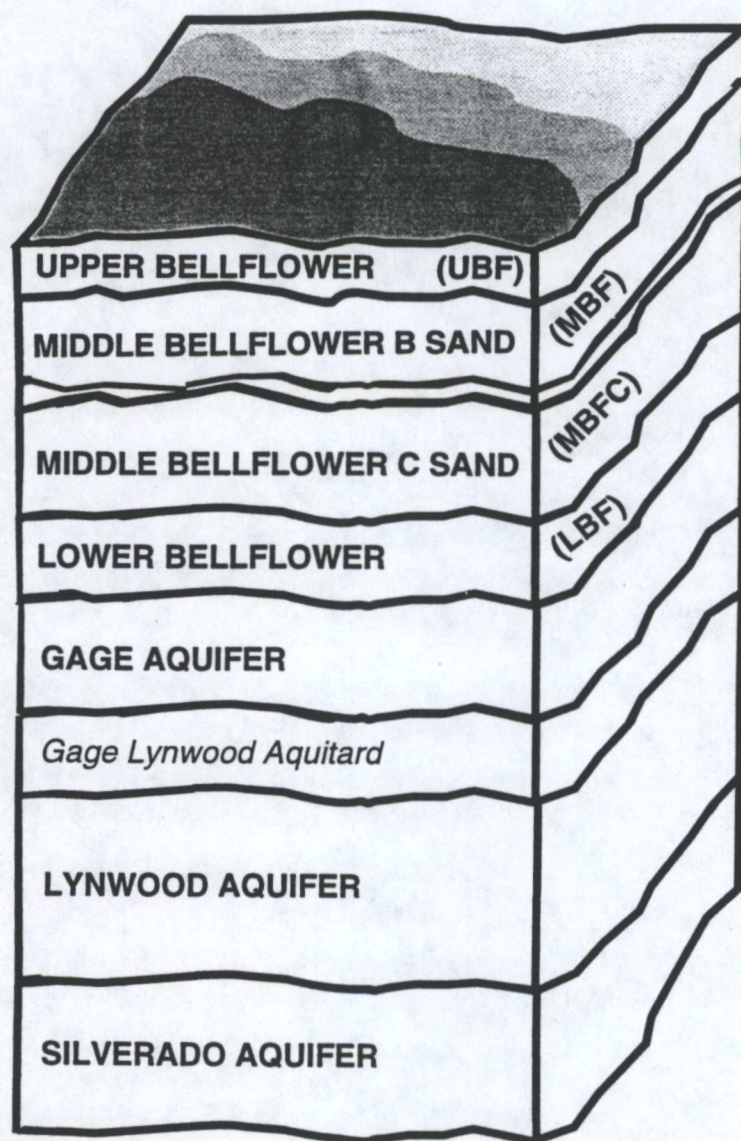
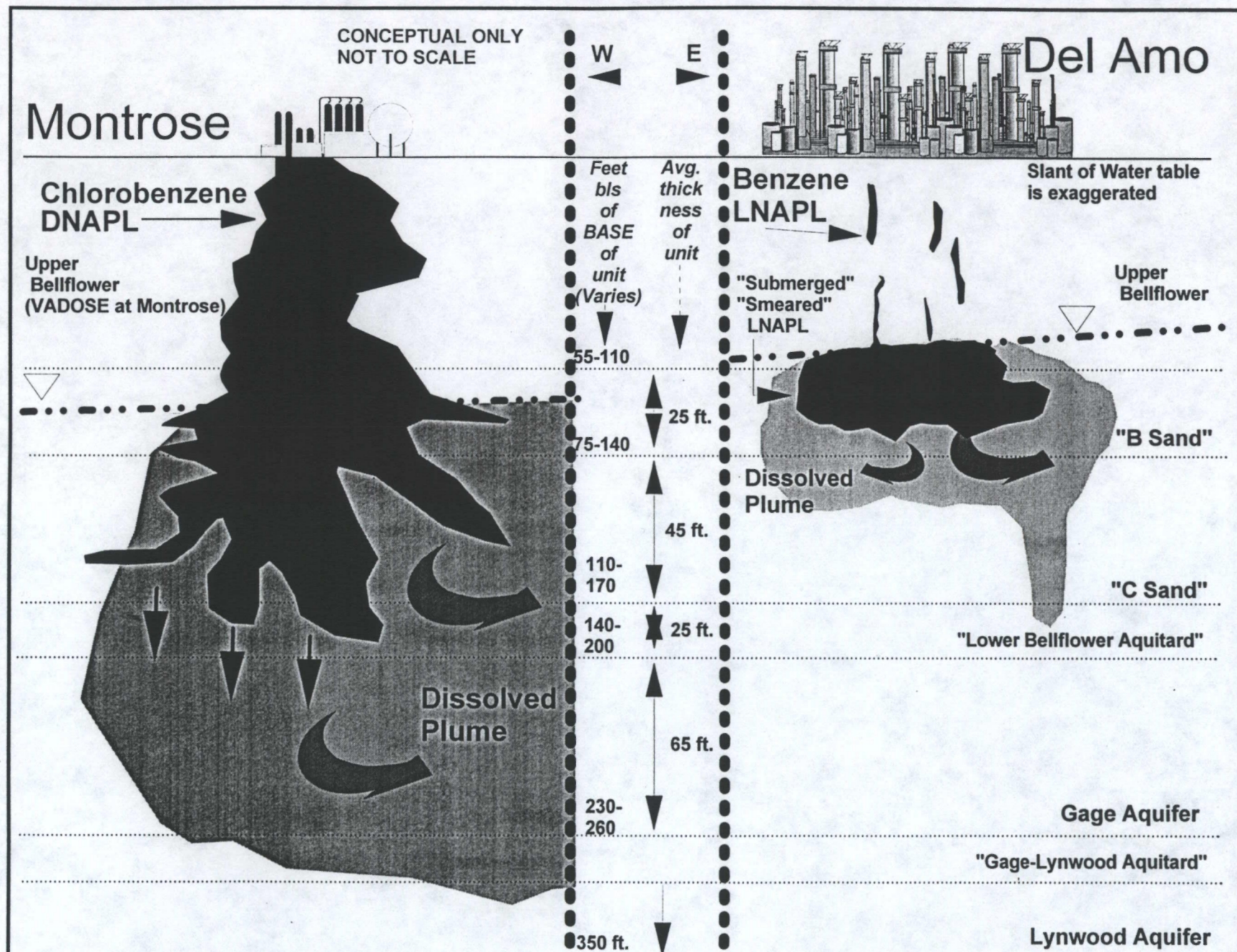


Figure 3: Hydrostratographic units



Montrose and Del Amo Superfund Sites
Dual Site Groundwater Operable Unit Proposed Plan
Technical and Expanded Version
U.S. EPA, Region 9, June 1998



**Figure 4: Cross Section;
NAPL and Dissolved Plumes**



Montrose/Del Amo Superfund Sites
Proposed Plan: Dual Site Groundwater Operable Unit
Technical and Expanded Version
U.S. EPA, Region IX, June, 1998

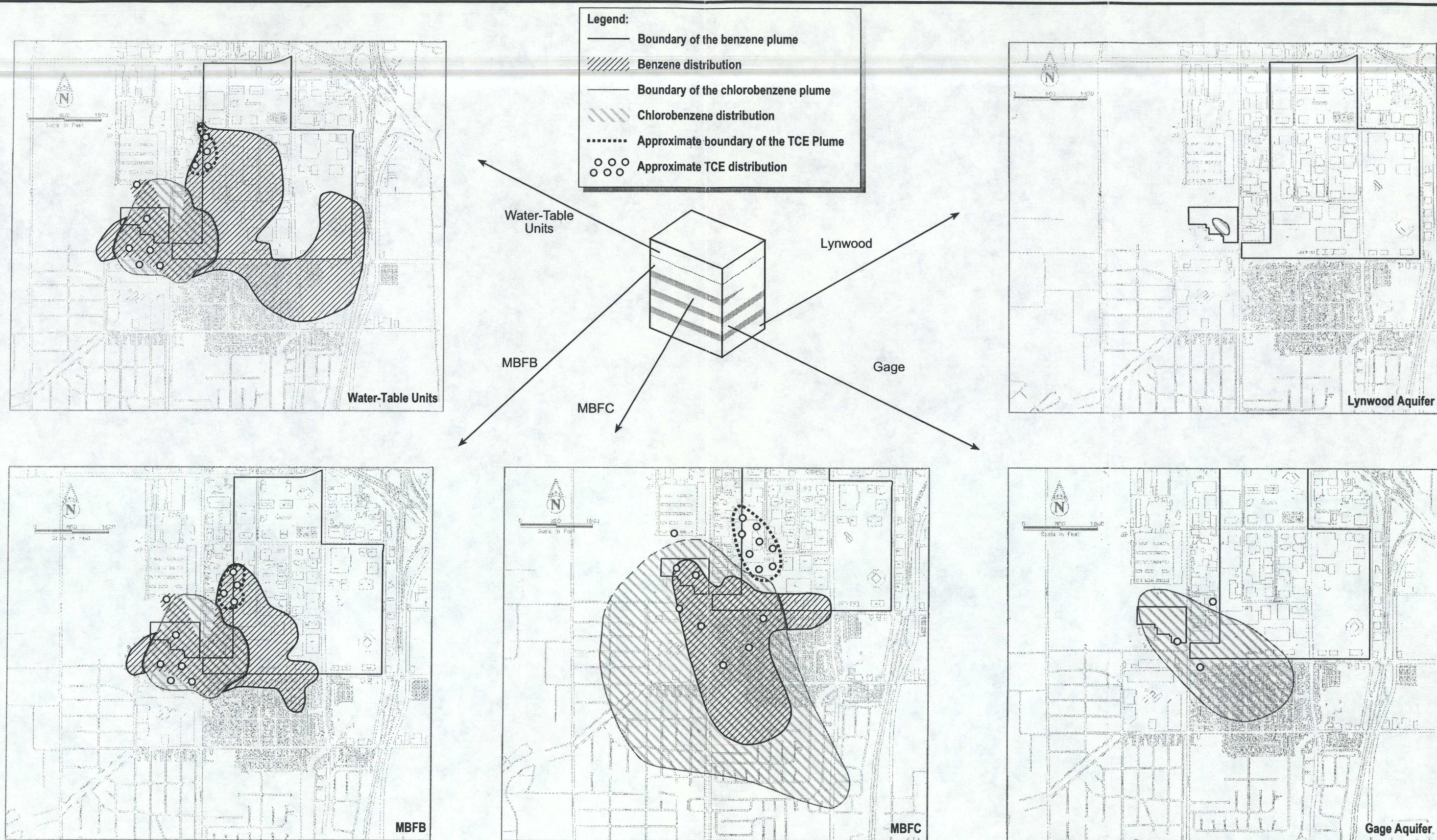


Figure 5: Dominant Contaminant Distributions, and Plumes as Defined for this Proposed Plan



Montrose/Del Amo Superfund Sites
Proposed Plan: Dual Site Groundwater Operable Unit
Technical and Expanded Version
U.S. EPA, Region IX, June, 1998

on the data that are available. The TCE under the former Del Amo plant is commingled with the benzene in the MBFB Sand, but in the MBFC Sand, it appears that the TCE distribution is still to the north of the benzene, which is limited to the area under the Del Amo Waste Pits. Therefore, in the MBFC Sand, under and near the former Del Amo plant, the TCE and the benzene are not commingled (Figure 5).

Because it is much more water-soluble than chlorobenzene, p-CBSA is more mobile in groundwater and the lateral extent of the p-CBSA in groundwater exceeds that of the chlorobenzene in all directions. The p-CBSA plume is commingled with the benzene on the west side of the former Del Amo plant. The maximum concentration of p-CBSA is about 110,000 ppb (in the NAPL area directly under the former Montrose plant, concentrations of p-CBSA reach 1,100,000 ppb.). The concentration of p-CBSA is 500-1000 ppb at the toe of the chlorobenzene plume (point where chlorobenzene concentrations are at the MCL for chlorobenzene, which is 70 ppb). Readers are referred to the remedial investigation reports and the JGWFS for more information on p-CBSA distribution in groundwater. Because it has no promulgated standards associated with it, p-CBSA is addressed independently of all other chemicals in this proposed plan. See Section 11 for EPA's proposal with respect to this contaminant, and Section 6 for a discussion of its toxicological status.

Conventions for Dividing the Contamination into "Plumes"

Later sections of this document strongly depend on the concepts presented in this paragraph. As is apparent in the above discussion, various portions of the groundwater contamination at the joint site display differing characteristics depending on the location, and most-importantly, whether there is commingling with chlorobenzene. Because of this, EPA has considered different remedial actions for various areas of groundwater. EPA has defined three areas of groundwater by convention, each a subset of the overall contaminant distribution, and given them names. The first area is called the "chlorobenzene plume." It consists of the entire chlorobenzene distribution and all other groundwater contaminants in it, including some benzene and TCE. The second area is called the "benzene plume" and includes only the benzene that is *not commingled* with chlorobenzene. The third area, called the TCE plume, consists only of the TCE at the joint site that is *not commingled* with the chlorobenzene. This includes TCE commingled with the benzene plume in the MBFB Sand, and TCE in the MBFC Sand that lies directly *under* the benzene plume in the MBFB Sand. The solvent facilities serving as sources of TCE contamination that lie immediately upgradient of the benzene plume in the MBFB Sand are also considered to be part of the TCE plume.

TCE and benzene that *are* commingled with chlorobenzene are, as stated, considered part of the chlorobenzene plume. Figure 5 shows the three plumes (see legend).

Therefore, this proposed plan and the JGWFS due not use the term "plume" to mean the entire distribution of a contaminant in groundwater. Instead, the term is reserved to define a specific area of groundwater displaying a particular set of physical characteristics and for which common remedial actions are evaluated. Each of the alternatives EPA considered for this proposed plan contain a remedial action for each of the plumes.

Presence of and Potential for Reliance on Monitored Intrinsic Biodegradation

Part of this proposed remedy relies on intrinsic biodegradation, which refers specifically to the process of the breakdown of a contaminant by microorganisms that are native and innate to the existing soils. Intrinsic biodegradation can slow, halt, or reverse the outward migration of a dissolved phase contaminant in groundwater, but it only occurs under certain conditions, with certain contaminants. To rely on intrinsic biodegradation in a remedial context, it must not only be present but there must be enough confidence that it will reliably achieve the remedial objective for which it is being used. When EPA does rely on intrinsic biodegradation (or any form of natural attenuation) EPA also requires extensive and continual monitoring to ensure that the biodegradation remains effective and that human health and the environment remain protected.

At the joint site, there is significant evidence of intrinsic biodegradation of the benzene plume in the UBF and the MBFB Sand. Factors present with respect to the benzene plume that support the ability to rely on intrinsic biodegradation as a remedial mechanism for this portion of the benzene plume are:

- The concentration gradients at the leading edge of the benzene plume are steep;
- The lateral extent of the dissolved plume outside of the NAPL sources is small;
- The benzene plume is much smaller than what would be expected based on groundwater velocity and expected retardation in the absence of intrinsic biodegradation; benzene has not migrated far from the NAPL sources despite being in the ground 20-40 years;
- The plume appears to be at steady state and does not appear to be migrating laterally;
- In-situ measurements of geochemical parameters (e.g. dissolved oxygen, nitrate, sulfate, methane, etc.) indicate biological activity that is related to (varies spatially with) the benzene concentration in groundwater;
- Biodegrader organism counts in groundwater indicate greater biological activity inside the benzene plume than outside the benzene plume;

- Computer modeling runs could not be reasonably calibrated without assuming significant biodegradation;
- An extensive body of research and literature is available to support that: a) the chemical pathways by which benzene degrades are well understood, b) benzene is known to biodegrade in a wide range of conditions in the laboratory, and c) benzene is known to biodegrade in a wide range of environmental conditions in the field, including those found at the joint site.

It is noted that some of these factors, taken by themselves, do not conclusively prove that intrinsic biodegradation of benzene is occurring in the benzene plume groundwater nor that it occurs reliably. However, when all lines of evidence are taken together, the case for reliable intrinsic biodegradation of benzene *in the benzene plume* is strong. Note that these lines of evidence do *not* apply to the benzene that is commingled with the chlorobenzene plume.

In contrast, sufficient lines of support for reliable intrinsic biodegradation of chlorobenzene at the joint site are not present. While intrinsic biodegradation of chlorobenzene may be occurring to some degree,

- The state of the chlorobenzene plume, especially the fact that the plume has been able to expand to its large lateral and vertical size, is not supportive of the presence of significant and dependable intrinsic biodegradation of chlorobenzene and indicates that such degradation is not likely to be substantial enough to rely upon as a remedial mechanism in remedy selection;
- The mechanisms by which chlorobenzene can be degraded in groundwater at the joint site, while outlined in theory, are only partially understood, are supported by a relative sparsity of laboratory studies, and are even less-well understood under field conditions, particularly in the conditions likely to exist at the joint site;
- Of the relatively few laboratory studies pertaining to biodegradation of chlorobenzene, those in which biodegradation took place occurred under aerobic (oxygen present) conditions; other studies showed that biodegradation of chlorobenzene may be inhibited under anaerobic (oxygen absent) conditions; yet the conditions in the aquifers in which chlorobenzene contamination is extensive (in particular, the MBFC Sand and the Gage Aquifer) are likely to be anaerobic, not aerobic (for more information, see JGWFS);

The following two factors, in conjunction with the above observations, further imply that intrinsic biodegradation of chlorobenzene cannot be conclusively relied upon in a remedial

context:

- The location of chlorobenzene in deeper aquifers, as well as the higher transmissivities of those aquifers (including drinking water aquifers) implies a greater risk associated with continued movement of the chlorobenzene plume, which makes reliance on intrinsic biodegradation for the chlorobenzene dubious;
- It is unlikely that the biodegradation rate for chlorobenzene could be measured in the field with enough certainty that would allow for it to be used as a reliable remedial mechanism.

Based on the above, biodegradation is an integral component of remedial alternatives for the benzene plume, but not for the chlorobenzene plume. Likewise, there is little evidence to conclude that the TCE plume is subject to intrinsic biodegradation sufficient, for instance, to keep it contained at the joint site. This is further discussed in Section 9. In the areas where alternatives considered in this proposed plan rely on intrinsic biodegradation as a remedial mechanism, EPA also proposes extensive and continual groundwater monitoring to ensure that it remains effective and protective of human health and the environment.

Computer Modeling Effort and Plume Interactions

Two concerns addressed (among others) during the Joint Feasibility Study were: (1) that actions considered for the chlorobenzene plume not cause adverse movements of the other plumes, and (2) that remedial actions that involved pumping not reduce interstitial pore pressures and/or induce drawdowns in the NAPL areas, possibly resulting in more downward migration of the NAPL or the dissolved contamination at high concentrations which is associated with the NAPL. These concerns were addressed by EPA in constructing all remedial alternatives (other than the No Action alternative) considered for this proposed remedy. A primary tool in this effort was a computer-based groundwater flow and contaminant transport model.

MODFLOW, a three-dimensional finite difference model, was used to simulate groundwater flow. MODFLOW was linked to the transport model MT3D for the transport simulations. Horizontal and vertical hydraulic conductivities, where unavailable, were interpolated based on a sequential gaussian protocol. Fixed source term concentrations were used for areas of suspected NAPL. The model had 60,000 cells with a node size of 200 by 200 feet. The model domain included what has come to be called the joint site, and many smaller sources of contamination outside the joint site so as to evaluate the potential for minimizing hydraulic influences at those locations. All scenarios modeled assumed the basic approach of a NAPL isolation surrounded by a larger dissolved plume. The model simulated various options to reduce the volume of the chlorobenzene plume outside the NAPL isolation zone. The feasibility and implications of NAPL isolation were evaluated, as well as the effect of various wellfields and pump rates on plume

volume reduction. Readers interested in the model, its documentation, results, uncertainties, and implications, are referred to Section 5 and Appendix B of the JGWFS.

The model is a highly useful tool for providing a basis of evaluating the performance of alternatives on a comparative basis, and for assessing the approximate size and nature of remedial systems required to achieve a given hydraulic effect in the aquifer system. These are the purposes to which EPA has put the model in its analysis of alternatives for the joint site. At the same time, EPA is concerned that the results of the groundwater model only be seen in the context of, and as properly restricted by, the model's limitations. All models have uncertainties and limitations. Those applying to the model used for the JGWFS, and the reasons for them, are addressed in detail in Section 5 and Appendix B of the JGWFS. While the limitations do not diminish the valid uses of the model, they are critical to understanding this proposal. Of particular note are the following:

- The model cannot be used to simulate absolute cleanup time frames, and for several reasons, the simulated time frames from the modeling effort are likely shorter than the actual time that will be required to complete the cleanup. Therefore, with respect to time frames required for cleanup, the model can only be used on a relative basis to compare the performance of the alternatives.
- The longer the time frame simulated, the greater the uncertainty associated with the modeling result. Simulations greater than 50 years into the future are generally not reliable or useful. EPA has used simulations of 10-25 years for comparing remedial alternatives, even though the remedial action is not complete in that time frame under any of the alternatives. This provides a measure of each alternative's relative performance and progress at 25 years toward meeting the remedial objectives.
- The model cannot account for local small scale heterogeneities and preferential flow paths, which could provide an explanation for some of the observed contaminant distributions.
- The modeling results for vertical transport from the MBFC through the LBF to the Gage Aquifer, and for vertical transport from the Gage Aquifer through the Gage-Lynwood Aquitard to the Lynwood Aquifer, are associated with such high uncertainty as to be largely unreliable.
- The model cannot be used to simulate movement of the chlorobenzene plume in the MBFB Sand near the former Montrose plant.

A summary of selected significant findings of the modeling effort are as follows:

- Hydraulic containment (isolation) of the NAPL at the joint site feasibly can be achieved. The zones of hydraulic capture must be somewhat larger than the actual physical dimensions of the NAPL. The associated pump rates have been approximated.
- Adverse downward migration of chlorobenzene DNAPL due to reduction of interstitial pore pressures and drawdowns in the NAPL zone can be avoided if: (1) the isolation zone extraction well(s) is (are) placed somewhat downgradient of the actual NAPL source, and (2) if aquifer re-injection is used to provide hydraulic control in the area of the NAPL. Accordingly, aquifer re-injection is considered a *necessary* component of the alternatives for the chlorobenzene plume.
- Reducing the volume of the chlorobenzene outside the NAPL isolation zone (i.e. restoration of the chlorobenzene plume) is feasible. Three different wellfields were examined which fall on a scale of increasing aggressiveness: a 350 gallon-per-minute (gpm) wellfield, a 700-gpm wellfield, and a 1400-gpm wellfield. The long and short-term performance of these wellfields has been evaluated and is described in the JGWFS.
- It is feasible to minimize or eliminate adverse movements of the benzene plume and TCE plume were the chlorobenzene plume to be pumped at any of the three degrees of aggressiveness (in terms of pumping rates) considered.
- Hydraulic influences on contaminant sources outside the Montrose/Del Amo sites and plumes, such as the Mobil Refinery to the west and the McDonnell Douglas facility to the north of the former Montrose plant, can be minimized if aquifer injection of treated water is used as part of the remedy so as to provide control on the region of influence. In order to provide hydraulic control, and minimize drawdown and reductions in pore pressures in the region of the NAPL, aquifer injection of treated water is a necessary component of the alternatives for the chlorobenzene plume.
- If no action is taken for the chlorobenzene plume, the model predicts that it continues to migrate.
- The model predicts that little reduction in the volume of the benzene plume can be attained by pumping it, if the modeling assumptions are correct. The benzene plume feasibly can be contained by pumping, however, and there are reasonable benefits to be considered from such pumping.

Other results of the model are discussed in the context of the discussions which follow.

SECTION 5: Land Use and Groundwater Use

Land Use and Zoning

Land use at the joint site facilities includes heavy and light industrial, commercial, and residential zoning. Low-income residential areas lie adjacent to the two former industrial plants. Most of benzene plume lies under the former Del Amo plant, but some of it lies under the northern edge of the residential zone south of the former plant. Most of chlorobenzene plume lies under residential and commercial areas south and southeast of Montrose. The TCE plume lies entirely within industrial areas. An estimated 2400 homes lie within one mile to the south, southeast, and southwest of the Montrose plant.

The Del Amo plant site has been redeveloped and contains light industrial enterprises. The Montrose plant site is not redeveloped and remains an asphalt-covered, vacant lot.

Water Use and Designations, and Why is EPA Concerned?

The State of California designates all of the water-bearing hydrostratigraphic units under the joint site as having potential potable beneficial use, i.e. as being a potential source of drinking water. Therefore, EPA considers drinking water standards (maximum contaminant levels, or MCLs) to be relevant and appropriate requirements for in-situ cleanup of groundwater at the joint site.

There currently is no municipal water or municipal production wells in use within the area of contaminated groundwater under the joint site. EPA is also not aware of private potable water wells within the contaminated groundwater affected by the joint site. The nearest municipal supply wells are about ½ to 1 mile down-gradient of the current leading edge of the chlorobenzene plume in the MBFC Sand. These wells are screened primarily in the Silverado aquifer, though some are screened in the Lynwood Aquifer. The Silverado Aquifer is the most-extensively used water-bearing unit for municipal supply purposes in the southern west coast groundwater system. This aquifer is a minimum of 450 feet below land surface. There are a number of other private and industrial wells within a mile of the plume, some of which have screens in the Gage Aquifer. None of these are located within the current contaminant distribution of the joint site. It appears likely that some water use within the joint site would exist if the aquifers were not contaminated. The groundwater basin under the joint site is presently adjudicated to reduce salt water intrusion problems which were occurring in the 1960s. At present, this would limit, but not eliminate, the degree of use of groundwater in the area.

EPA is concerned that the groundwater contamination may continue to move both laterally outward and vertically downward, and may eventually reach locations where it would be drawn

into wells which are used for drinking or other potable purposes. As contamination spreads, less of the groundwater resource can be used in the future.

The laws and policies of the State of California are generally focused on protecting potential future beneficial uses of groundwater, even where it is not currently used. It is important to note that the alternatives being considered for this action may result in cleanup efforts that will take a very long time, perhaps on the order of a century. EPA therefore considers it prudent to consider the greater potential that water use patterns, policies and needs would change within this enormous period of time, and that the water would be used. Relatively lesser weight is therefore given to current plans for groundwater use, to the extent these can be discerned today.

Without the joint site contamination, the Lynwood and the Gage Aquifers would be of sufficient water quality and production to make them strong candidates for drinking water use. It is likely that groundwater in the area is in a state of disuse at least partially because of the contamination at the joint site. The MBFC Sand and shallower units contain higher levels of total dissolved solids and total suspended solids such that future direct use of the water for potable purposes would be somewhat less likely, though it could not be ruled out. The MBFB Sand and Upper Bellflower likely do not yield enough water to make major production wells in these units cost-effective. Because of the depth and attending cost of installing wells in the Silverado and Lynwood Aquifers, non-potable water uses, as well as potable water uses of random and scattered private users, should be considered possible in all the affected units, especially the Gage Aquifer.

Migration of contaminants from the upper to the lower units at these sites has occurred and there is the potential for continued migration. Therefore, the potential for such migration to affect units which currently are not significantly impacted or used is strongly considered by EPA in this proposal, in conjunction with the direct current water use and State designations for all units. While there is not evidence that persons have been exposed to groundwater contaminants from these sites, EPA is concerned about preventing future threats to public health and with preserving the groundwater resource.

SECTION 6: Groundwater-Related Risks

To determine the potential health risks associated with contamination at hazardous waste sites, EPA conducts a risk assessment. EPA's risk assessment does not evaluate past exposures or existing health effects. Such exposures and health effects are evaluated by the Federal Agency for Toxic Substances and Disease Registry (ATSDR). This technical and expanded version of the proposed plan assumes that readers are familiar with what a risk assessment is, and the basic ways in which cancer and non-cancer risk is calculated by EPA. Those lacking and wishing to obtain this information should review the general fact sheet version of this proposed plan and/or the Joint Groundwater Risk Assessment (JGWRA) for the joint site, and/or EPA's *Risk Assessment Guidance for Superfund*. This technical and expanded version of the proposed plan provides additional detail on the risk calculations that were performed for the joint site.

Currently, there is not an immediate *direct* risk from groundwater at the joint site because no one is currently drinking the contaminated groundwater and so there is no current exposure to groundwater contaminants. However, EPA's goal is to ensure that actual exposure of people to contaminated groundwater at the joint site does not occur. Because there is the potential that contaminated groundwater could be used in the future, EPA's risk assessment evaluates what the risk *would* be *if* someone were to use the groundwater. Such a person could be exposed to contaminants by such activities as ingestion of the water, direct contact, or by inhalation of certain contaminants which volatilize out of the water during showering, toilet flushing, and clothes washing.

The JGWRA and its Supplement calculates the hypothetical risk to a person who uses the groundwater from any given hydrostratigraphic unit, based on conditions which exist in groundwater today. When evaluating possible remedial actions, EPA typically relies on reasonable maximum exposure (RME) risks, including groundwater uses that result in ingestion, inhalation, and dermal contact. Risks from these pathways have been calculated for each hydrostratigraphic unit. The risk assessment did not focus solely on chlorobenzene, benzene, and TCE, though these do provide the vast majority of the total potential human health risk. Rather, all chemicals in groundwater were considered by the risk assessment.

The potential risks (cancer and non-cancer) from joint site groundwater have been calculated for this proposed remedy by two methods. The first utilized a "*plume averaging*" approach in which it was assumed that the receptor was exposed to the average of concentrations measured in monitoring wells in a given hydrostratigraphic unit. The plume averaging approach may provide more of an overall sense of the risk and may be appropriate as a means of simulating risk in the event that many wells were to be placed in the plume and the water from them blended prior to service. The second method was to generate *risk contours*, which present a *spatial distribution*

of risk. With contours, one can see how the risk to a person placing a single well would vary from point to point in any of the plumes; in effect, how the risk is distributed spatially within the plume.

Neither of these approaches is intended to supersede the other; rather, it is EPA's intention that they be used together to provide a better picture of overall risk for the joint site. The description of these methods, and a statement as to the relative drawbacks and benefits of each, is provided in the JGWRA and in Section 3 of the JGWFS.

Summary of Cancer and Non-Cancer Risks by the Plume Averaging Method				
	Cancer Risk		Non-Cancer Hazard Index	
	Chlorobenzene Plume	Benzene Plume	Chlorobenzene plume	Benzene Plume
MBFB Sand	Calculated in EPA's Risk Contours	3×10^{-1}	Calculated in EPA's Risk Contours	12,724
MBFC Sand	7×10^{-4}	1.3×10^{-1}	178	9,839
Gage Aquifer	1×10^{-5}	*	50	*
Lynwood Aquifer	N/A	N/A	7.2	N/A

* The benzene in the Gage Aquifer is in the chlorobenzene plume

Risks associated with the UBF were only calculated by the contouring method. Risks associated with contamination in the Lynwood Aquifer were only calculated by the plume averaging approach. The reasons for this are presented in the Joint Groundwater Risk Assessment.

The result of the risk assessment is that the risks from the joint site, should anyone use the groundwater, are extremely high. Risks calculated by the plume-averaging method are as much as 12,000 times what EPA would consider a safe concentration for potable use and are above acceptable levels in all of the affected hydrostratigraphic units. Risks at the center of the plumes, calculated by either method, are as much as one hundred thousand times greater than EPA's point of departure guideline of one in a million excess lifetime cancer risk (10^{-6}) and between 10,000 and 100,000 times greater than the acceptable non-cancer hazard index of 1. Once again, users of water within the joint site are not exposed to this contamination presently and such risks would only be realized if the water at the joint site were used, either at locations presently affected or after the contamination has spread further. It is this potential risk that is of concern to EPA.

The risk assessment status for p-CBSA must be briefly mentioned. This chemical is a unique by-product of the DDT manufacturing process and is present in high concentrations up to 110,000 ppb downgradient of the Montrose facility at the joint site (in the NAPL area directly under the former Montrose plant, concentrations of p-CBSA reach 1,100,000 ppb.) p-CBSA occurs in all aquifers in which chlorobenzene occurs, and covers a wider lateral area of the aquifers than does chlorobenzene.

There are no promulgated health-based standards for p-CBSA, and there are no accepted toxicological values (slope factor, HI, dose-response relationships, etc.) for this compound. There are no chronic studies and a few limited acute studies of the toxicity of p-CBSA in animals. The few and limited short-term studies, taken alone, provided no indication of mutagenic or teratogenic health effects and suggested that gavage dosages could be raised above 1000 mg/kg/day without observable toxic effects. This would suggest a low toxicity. However, more short-term studies would be needed to confirm these results and no chronic studies have been done; therefore, these results are inconclusive. EPA believes there are insufficient data upon which to establish provisional standards for p-CBSA. Based on one sub-chronic non-cancer study, the State of California has adopted a non-promulgated and provisional NOEL of 1 mg/kg/day for p-CBSA, that would translate to a provisional drinking water standard of 25,000 ppb.

EPA intends to monitor any future toxicological studies on p-CBSA, however no studies currently are planned. Primarily, this is for two reasons: (1) While p-CBSA is prevalent at the joint site, many chemicals are awaiting study nationally and the occurrence of p-CBSA at hazardous waste sites is rare nationwide, and (2) the *preliminary* screening tests performed suggested a relatively low toxicity, reducing the priority of p-CBSA studies compared to other chemicals awaiting study. Establishing priorities for study of the health effects of chemicals is only partially within the influence of EPA. EPA will ensure that the persons making decisions on prioritization of toxicological studies are aware of the presence and nature of p-CBSA at the joint site.

SECTION 7: Proposal for Technical Impracticability Waivers

When groundwater poses an actual or potential health risk and is a potential drinking water source or could affect a drinking water source, the regulations for Superfund (called the National Contingency Plan, or NCP) direct EPA to attempt to restore groundwater to federal and State drinking water standards, in a reasonable time frame. Attainment of these drinking water standards, in-situ within the groundwater, is a definitive ARAR for this proposed remedial action. Attainment of the lower of the federal or State drinking water standard, known as the Maximum Contaminant Level, or MCL, is considered a relevant and appropriate requirement. For chlorobenzene, this is 70 ppb; for benzene, 1 ppb; and for TCE, 5 ppb.

However, there are situations in which there is no known technology or means capable of restoring groundwater to drinking water standards. When this happens, EPA issues what is called a technical impracticability waiver ("TI waiver") to those requirements that would typically imply cleanup of groundwater to drinking water standards. The area to which a technical impracticability waiver is applied is called a "TI Waiver Zone." Issuance of a TI waiver does not preclude that other standards or remedial actions apply to the contamination within the zone in lieu of the particular requirements that are waived.

Much of the groundwater at the joint site can be restored to drinking water standards. However, it will be technically impracticable to remove enough of the NAPL at the joint site to attain drinking water standards everywhere in the groundwater. EPA proposes to issue a TI waiver for a portion of the groundwater at the joint site. The presence of NAPL alone generally is not sufficient to justify a TI waiver. EPA guidance directs that a TI waiver be justified on site-specific conditions. EPA has done this in great detail in Appendix E of the JGWFS. The following section serves only to provide highlights. This section also summarizes EPA's proposal regarding the size and location of the TI waiver zone in each of the hydrostratigraphic units. EPA proposes the TI waiver zone that was assumed in Appendix E of the JGWFS. This proposal applies to all alternatives (except the No Action Alternative) evaluated for this proposed plan.

The following principles have been applied to the formulation of the TI waiver zone proposal:

- EPA proposes that the TI waiver zone be as small as reasonably possible while still meeting all objectives of the remedial action.
- Where TI waivers are applied, EPA proposes to apply the waiver to *all* chemicals within the TI waiver zone, regardless of whether all of the chemicals served to base the original justification for the waiver. As an example, if there is a TI waiver zone due to benzene

NAPL, all other non-NAPL contaminants in the same zone would also be subject to the waiver.

Summary of Why NAPL Areas Cannot Be Restored to Drinking Water Standards

NAPL is known as one of the most challenging and recalcitrant of all Superfund problems. While in most cases there are technologies that can remove some NAPL, it is often necessary to remove virtually all NAPL before concentrations in groundwater near the NAPL can approach drinking water concentrations. Presently, there are no technologies which have been proven to be capable of removing *all* NAPL from sites where NAPL is widely distributed laterally and vertically, and where stratigraphy is highly heterogeneous and complex.

At the Montrose site, the soils are highly heterogeneous. DNAPL has migrated downward to great depths (as deep as 200 feet below land surface) and there are no significant and continuous confining layers in the areas where the majority of the NAPL occurs. DNAPL is present both in pockets at above-residual saturation levels, and in ganglia and "fingers." The majority of the DNAPL is below the water table. The DNAPL relative saturation distribution has not been determined, and it is impracticable to do this to a highly accurate degree. While Montrose Chemical Company is continuing, under EPA oversight, to evaluate the NAPL, its properties and distribution, and evaluate options for removing some NAPL, it will not be practicable to remove enough (virtually all) NAPL so as to attain drinking water standards.

At the Del Amo site, there is also substantial heterogeneity in the soils. Although benzene is a LNAPL, in this case the NAPL is smeared below the water table. The NAPL that has been located and subjected to extensive testing appears to be present at low (below residual) saturations. Therefore, the studied NAPL appears to be present primarily in ganglia and droplets held in pore spaces by capillary forces. The former Del Amo plant site also presents the additional complication of having many multiple sources of NAPL which are separated spatially but still relatively close from the standpoint of producing dissolved groundwater contamination. Thus, removal of virtually all the NAPL would have to occur in all of the multiple areas before drinking water standards could be achieved. As with respect to the Montrose site, the Shell Oil and Dow Chemical Companies are working under EPA oversight to further evaluate options for removing some of this NAPL. However, it will not be practicable to remove enough of the NAPL to attain drinking water standards.

Significantly more detail on this argument is provided in Appendix E of the JGWFS.

Proposed Location and Size of the TI Waiver Zone

The TI waiver zone must be larger than the NAPL itself, for two major reasons:

1. In all alternatives (except No Action), at least part of the NAPL at the joint site is isolated by a hydraulic containment system, which has a zone of capture which must be larger than the NAPL. All water inside the NAPL isolation zone must be subject to the TI waiver, because the NAPL continuously contaminates any water that is within the isolation zone.
2. As discussed, the alternatives modeled for this remedial action ensure that NAPL will not be mobilized by the pumping that creates the NAPL isolation zone. To do this, the extraction wells used to contain the NAPL were placed somewhat downgradient of the NAPL so as to limit drawdowns and reductions in interstitial pore pressures in the NAPL areas. The drawdowns at the NAPL locations under various cleanup scenarios were evaluated by the groundwater model.

EPA determined the smallest reasonable zone in which it appears feasible to implement containment to isolate the NAPL *without risking the inducement of adverse migration of NAPL*. This minimum reasonable area was evaluated separately for the Montrose DNAPL and the Del Amo LNAPL.

Benzene and TCE Plumes in the UBF and MBFB Sands. It would not be practicable to try to restore water in-between the multiple NAPL sources at the former Del Amo plant, as they are so close together. In addition, based on modeling and other evaluations, the ability to pull the edge of the dissolved benzene plume closer to the NAPL sources is at best highly limited. The minimum area needed to safely contain the NAPL at the former Del Amo plant is already close to the size of the entire benzene plume, because the dissolved plume has not moved far from the NAPL sources due largely to intrinsic biodegradation. EPA therefore proposes to make the TI waiver zone for the benzene plume congruent with the existing benzene plume, as measured by the drinking water standard for benzene (1 ppb). The proposed TI waiver zone in the UBF and MBFB Sand includes the benzene and TCE at the joint site which lie in these units outside the chlorobenzene plume. This is further discussed in Appendix E of the JGWFS.

Benzene and TCE Plumes in the MBFC Sand. The following applies to the TI waiver with respect to the MBFC Sand under the benzene plume in the MBFB Sand (at the former Del Amo plant):

- Benzene in the MBFC Sand is limited to the area surrounding the waste pits. There is

inconclusive evidence that benzene NAPL is present in the MBFC Sand in the benzene plume near the Del Amo waste pits. As benzene is an LNAPL, it should have floated on the water table, and been smeared upward as the water table rose. Therefore, LNAPL should not be found deeper than the lowest elevation of the historical water table. High concentrations of benzene have been measured in one well screened at the bottom of the MBFC Sand near the waste pits. However, the water table has never resided as deep as the bottom of the MBFC Sand. Therefore, it cannot be concluded that benzene NAPL is present at in the MBFC Sand at this time.

- To the north of the Del Amo Waste Pits in the MBFC Sand, benzene is absent but TCE is present. Additional sampling will have to be conducted to determine the exact size of the TCE plume. However, it is known that the extent of the TCE plume does not reach the Del Amo Waste Pits area and that its major source appears to be at or near several solvent-handling facilities just northwest of the MW-20 NAPL area. As with the benzene to the south, there is insufficient evidence to conclude that the TCE is present as DNAPL in the MBFC Sand at this location.

While the presence of either benzene or TCE NAPL in the MBFC Sand cannot be concluded from existing data, EPA proposes to extend the TI waiver zone to the MBFC Sand to encompass these distributions because of their *proximity* to the benzene NAPL and high-concentration benzene in the MBFB Sand, directly above the MBFC Sand. The rationale for this is as follows:

The MBFB and MBFC Sand are separated by a thin layer of mud which does not provide a significant hydraulic barrier to the movement of water or contaminants. Without a TI waiver for the MBFC Sand, it would be required that the groundwater in the MBFC Sand be cleaned to drinking water standards for both TCE and benzene. To do so, hydraulic extraction (and treatment) would be required directly under the benzene NAPL and the extremely high concentrations of dissolved benzene present in the MBFB Sand. Under such hydraulic extraction, gradients would be created which would induce the movement of benzene and TCE in the MBFB Sand downward to the MBFC Sand. Gradient controls (such as limited counter-pumping in the MBFB Sand) could be applied to such extraction to limit this movement. With such controls, it would be practicable, in fact, to achieve overall *containment* of the contaminants in this area by hydraulic extraction. However, it would not be practicable to limit the contaminant movement from the MBFB Sand to the MBFC Sand to such a degree (virtually zero) that drinking water standards (1 ppb for benzene) could be achieved and maintained in the MBFC Sand.

Therefore, EPA proposes to extend the TI waiver zone to the MBFC Sand to include: (1) the benzene under the waste pits area in the MBFC Sand (2) the TCE upgradient of the waste pits area in the MBFC Sand which directly underlies the benzene plume in the MBFB Sand, and (3)

the TCE sources (solvent facilities) which lie on the very edge of the benzene plume, northwest of MW-20. It is noted that under this proposal, the fine-grained LBF would fall in between the TI waiver zone and the Gage Aquifer, which would *not* be subject to a TI waiver zone outside the chlorobenzene plume.

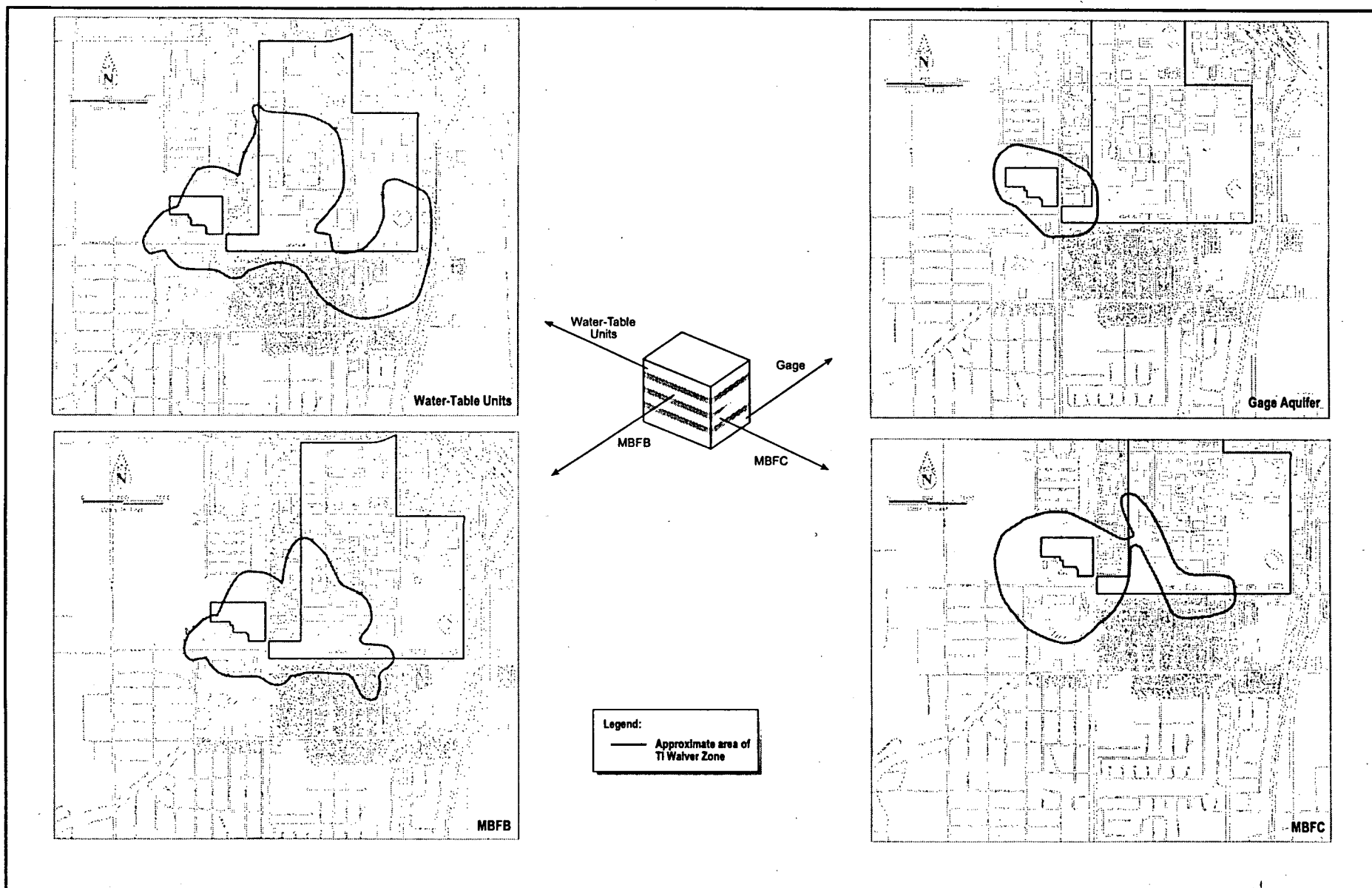
Chlorobenzene Plume. In the chlorobenzene plume, EPA proposes to extend the TI waiver zone to the Gage Aquifer. The best information available indicates this is the depth to which DNAPL may have migrated. However, the TI waiver zone would not extend to the Lynwood Aquifer; it is proposed that the groundwater with chlorobenzene contamination in the Lynwood Aquifer be restored to drinking water standards.

Summary of Proposed TI Waiver Location and Size. The JGWFS defines two separate TI waiver zones, one for the LNAPL and one for the DNAPL impacted areas. However, the size and relative locations of the separate TI waiver zones considered for TI waiver indicate that the area *between* the Montrose and Del Amo sites largely falls in the overlap of these two zones. *Accordingly, EPA proposes a single TI waiver zone for the joint site.* Figure 6 shows the proposed TI waiver zone. In the chlorobenzene plume, the lateral extent of the proposed TI waiver zone is based on safely containing the DNAPL, and extends to the Gage Aquifer. In the benzene plume, the proposed TI waiver zone is defined by the 1 ppb contour for the existing benzene plume. The proposed TI waiver zone includes the benzene plume in the UBF and the MBFB Sand, and the TCE plume and benzene plume in the MBFC Sand.

SECTION 8: Treatment Trains and Treated Water Discharge

Each of the alternatives considered by EPA in the JGWFS, except for Alternative 1, No Action, employs treatment of extracted groundwater. The treated groundwater must be discharged in some manner. In this case, the primary differences among the remedial alternatives considered by EPA lie in what each alternative is able to accomplish in the ground, rather than which technology is used to accomplish treatment of the extracted water. EPA proposes to allow a range of technologies and treatment trains to be available in remedial design to address each plume. This will allow for maximum flexibility in the design. EPA intends to identify all Applicable or Relevant and Appropriate Requirements (ARARs) that apply to these technologies in its Record of Decision.

The JGWFS screens technologies and assembles treatment trains that can be used for each plume, in the event that the water in that plume is subject to active hydraulic extraction (pumping) and treatment under an alternative.



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**Figure 6: Proposed TI Waiver Zone
in Each Hydrostratigraphic Unit**



Montrose/Del Amo Superfund Sites
Proposed Plan: Dual Site Groundwater Operable Unit
Technical and Expanded Version
U.S. EPA, Region IX, June, 1998

Under all alternatives (except the No Action Alternative), extracted groundwater from the chlorobenzene plume likely would be piped to a treatment plant located on the former Montrose plant property, where contaminant concentrations would be reduced to drinking water standards, or lower if necessary to meet requirements that may apply to the treated water discharge option. In alternatives where there is hydraulic extraction of the benzene plume, water from the benzene plume likely would be piped to a second treatment plant on the former Del Amo plant property. The likely locations of these are shown in Section 9 of the JGWFS.

The primary technologies identified in the JGWFS, after screening, to address the joint site contaminants are (1) liquid phase and vapor phase adsorption, (2) air stripping, and (3) fluidized bed reactor. These are shown on Figure 7. Other technologies that may be available on a modular basis are identified in the JGWFS. With **liquid phase adsorption**, the water coming into the treatment plant is run through a bed of activated carbon or resin beads, which adsorb the contaminants out of the water. When the carbon or beads are full of contaminants, they can be sent offsite and regenerated, which allows the contaminants to be safely recovered and destroyed, and the carbon or beads can be reused. Alternatively, the carbon can be sent to a landfill designed and approved to receive hazardous waste. With **air stripping**, the water is mixed with air and the volatile contaminants are transferred into the air. The air is then passed through a **vapor phase carbon adsorption** system and the contaminants are transferred to the carbon, just as with liquid phase adsorption. The clean air is then discharged back into the atmosphere. With **fluidized bed reactor**, the contaminated water is passed through a bed which has carbon with a biological sludge (a biofilm) on it. The bacteria in the sludge metabolize and degrade most of the contaminants into non-toxic forms. There is periodically the need to dispose of the sludge. When necessary, this disposal occurs at an approved hazardous waste landfill.

From these three primary technologies, EPA considered three treatment trains for the chlorobenzene plume, three treatment trains for the benzene plume, and two treatment trains for the TCE plume. These are:

- Chlorobenzene Plume:

- Carbon adsorption alone

- Air stripping followed by carbon adsorption polishing and vapor phase adsorption

- Fluidized bed reactor followed by carbon adsorption polishing

- Benzene Plume:

- Same 3 treatments as Chlorobenzene Plume

●TCE Plume:

Carbon adsorption alone

Air Stripping followed by vapor phase carbon adsorption

For all three plumes, the JGWFS identified Carbon Adsorption Alone as the *cost-representative treatment*. EPA's cost estimates of alternatives assumed that Carbon Adsorption was the treatment. In this way, the costs of all alternatives could be compared on an even basis. EPA's calculations indicate that Carbon Adsorption Alone is likely to be the most cost-effective option for each plume once the remedy is designed. By identifying a cost-representative treatment, however, EPA does not propose to limit the remedial design to this one treatment method. Rather, EPA proposes that all of the treatment trains identified above be available in the remedial design. Persons reviewing this proposed plan should therefore comment, as they deem necessary, as if any of these treatment trains and treatment technologies may be employed as part of this remedy.

As discussed earlier, aquifer re-injection is considered the crucial disposal option for the treated water for the chlorobenzene plume and the TCE plume. This is to provide hydraulic control and limit the potential for NAPL movement. Therefore, no other discharge options were evaluated in detail by EPA for the chlorobenzene and TCE plumes. However, three discharge options were evaluated for the benzene plume, for alternatives where the benzene plume is subject to hydraulic extraction. These are: aquifer re-injection, discharge to the storm drain (empties into the Dominguez Channel) and disposal to the sanitary sewer. Discharge to the Storm Drain was the representative discharge option used in the remedial alternatives for the benzene plume. The basis for this is described in the JGWFS, Section 7.

EPA has also considered several ancillary technologies in the JGWFS, where necessary to meet discharge standards. For example, the natural level of copper in some of the groundwater is slightly too high to meet standards for discharge to a storm channel, the discharge option for water treated from the benzene plume. In such cases, EPA has identified and proposes to use the treatment technologies necessary to meet discharge standards. In the case of copper, the JGWFS identified iron coprecipitation as a representative copper-reducing technology. Other ancillary technologies identified in the JGWFS include those necessary to reduce total dissolved solids prior to re-injection, and those necessary to prevent scaling of injection wells.

Types of Pump & Treat Systems

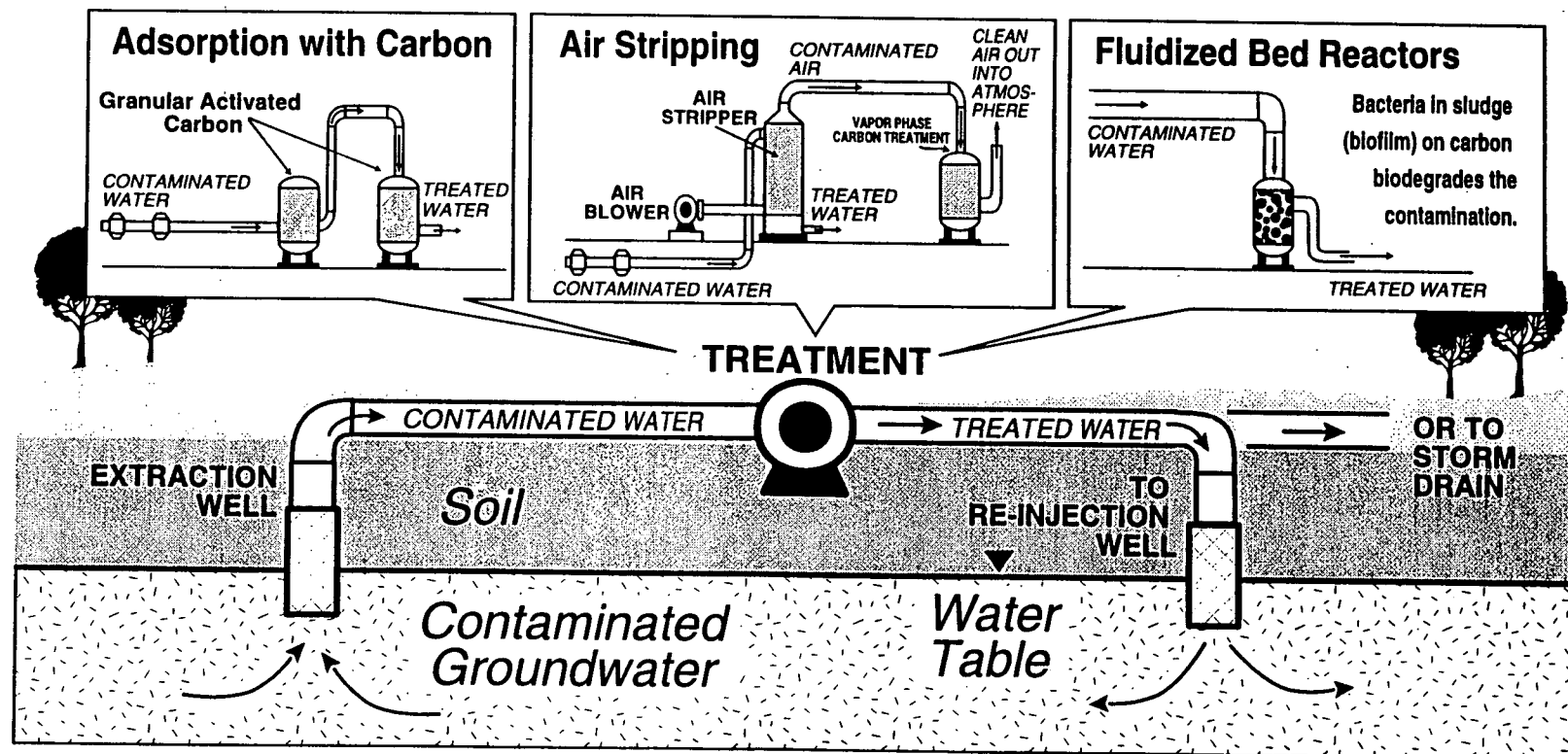


Figure 7: Groundwater Treatment Systems



Montrose and Del Amo Superfund Sites
Dual Site Groundwater Operable Unit Proposed Plan
Technical and Expanded Version
U.S. EPA, Region 9, June 1998

SECTION 9: Alternatives Considered

EPA has developed and evaluated five remedial alternatives. Each remedial alternative considered in the JGWFS, other than the No Action Alternative, consists of: (1) one action for the chlorobenzene plume, (2) one action for the benzene plume, and (3) one action for the TCE plume. Each action utilizes the cost-representative treatment train identified in the JGWFS, and the treated groundwater discharge option as discussed above. The JGWFS considered and evaluated potential interrelationships between the remedial actions in the process of assembling the alternatives.

EPA is proposing to implement **Remedial Alternative 4**, discussed below. In the JGWFS, this alternative bears the name **Benzene Hybrid Containment/Chlorobenzene Plume Reduction 2**. Alternative 1, No Action, is required by regulation to be included in EPA's evaluation for purposes of comparison, even though it would not be protective of human health.

Common Elements to All Alternatives (Other Than the No Action Alternative)

All alternatives considered for this remedy (other than the No Action Alternative, Alternative 1) include a TI waiver (shown in Figure 6), in which contaminants in groundwater are indefinitely contained. The means by which this containment is achieved varies in some of the alternatives, as discussed below.

The drinking water standards that serve as the ARAR for the cleanup of the in-situ groundwater that is outside the TI waiver (containment) zone are the lower of the federal and State contaminant-specific MCL for each groundwater contaminant. For chlorobenzene, this is 70 ppb; for benzene, 1 ppb; and for TCE, 5 ppb. Alternatives also assume that where more stringent treatment requirements apply or are relevant and appropriate in order to discharge the groundwater as proposed, that these requirements also will be met by the treatment system prior to discharge.

In Alternatives 2-5, the volume of the chlorobenzene plume (outside the TI waiver zone) that has concentrations above drinking water standards is reduced to zero. Alternatives 2-5 differ in terms of the aggressiveness, or rate, that the cleanup of the chlorobenzene plume outside the containment zone would occur. Three groundwater extraction rates for the chlorobenzene plume are reflected in alternatives 2-5: 350 gallons per minute (gpm), 700 gpm, and 1400 gpm. In the JGWFS, these pump rates represent the *Plume Reduction 1*, *Plume Reduction 2*, and *Plume Reduction 3* scenarios for the chlorobenzene plume. The higher the rate, the faster the cleanup would occur, and the greater the flushing of the pore spaces in the aquifer by the remedial system.

All of the alternatives (except Alternative 1) contain the following with respect to the **chlorobenzene plume**:

- Containment of the chlorobenzene DNAPL indefinitely, using active hydraulic extraction and treatment, within the TI waiver zone as specified earlier.
- Aquifer injection of treated water. As discussed earlier, this is *necessary* for the chlorobenzene plume for hydraulic control and to ensure that NAPL is not mobilized.
- Monitoring sufficient to confirm continuous plume reduction, containment of the NAPL zone, movement of contaminants within the plumes, groundwater levels, gradients, hydraulics, and effects of pumping.
- Contingent additional hydraulic extraction in the event that contamination leaves the containment zone (to which the TI waiver is applied).
- Institutional controls, to the extent possible (Note: This refers to existing legal and regulatory requirements which can be used to limit or prohibit the use of groundwater in the contaminated area. EPA is not in control of many of these requirements. It has not been determined that institutional controls would be effective in the long term other than as an enhancement to the proposed remedy. EPA's intention in identifying them here is to indicate that EPA would seek to obtain limitations on groundwater use in the affected groundwater as allowed under existing law and regulation as part of this action.)
- TI waiver applied to MBFB Sand, MBFC Sand, Lower Bellflower, and Gage Aquifer; the Lynwood Aquifer is not included in the proposed TI waiver and therefore Lynwood groundwater within the joint site would be restored to drinking water standards (See Section 7).

The benzene plume lies entirely within the TI waiver zone and so, under all alternatives considered other than the No Action Alternative, is not subject to volume reduction but rather containment. The means by which containment of the benzene plume is achieved varies among the alternatives, as discussed below. As a performance requirement, EPA proposes to require that the benzene plume remain contained within the TI waiver zone. If the benzene plume leaves the TI waiver zone in the future, additional active hydraulic extraction and treatment of the benzene plume would be implemented to re-establish hydraulic containment of the benzene within the TI waiver zone.

The following are components of all alternatives (except Alternative 1) for the **benzene plume**:

- Monitoring sufficient to confirm continuous containment of the benzene plume and

NAPL, the movement of contaminants within the benzene plume, the continued effectiveness of intrinsic biodegradation within the benzene plume, groundwater levels, gradients, hydraulics, and effects of pumping.

- Contingent additional hydraulic extraction in the event that contamination leaves the containment zone.
- Institutional Controls as Applicable (See note under chlorobenzene plume discussion, above).
- TI waiver applied to UBF, MBFB Sand and MBFC Sand, but not to the Gage or Lynwood Aquifers (See Section 7 of this document).

Approach to the TCE Plume

All remedial alternatives that EPA considered, other than Alternative 1, No Action, contain the same action for the TCE plume. [Recall that the term "TCE plume" refers to the TCE that is *not* commingled with chlorobenzene presently. This TCE lies, primarily, under the former Del Amo plant. See Sections 4 and 7 for discussion on TCE] EPA proposes to contain the TCE plume to the TI Waiver Zone, in the manner discussed below. The rationale for including one, and not several actions for TCE in the alternatives is presented below. In general, there is both a need for a remedial action to contain the TCE plume, as well as significant limitations on the manner in which the action can reasonably be implemented, due to the TCE plume's commingling and/or proximity to the benzene plume and benzene NAPL.

As mentioned earlier, the amount of data available regarding the TCE plume is comparatively less than that for the benzene and chlorobenzene plumes. The extent of the TCE plume at the joint site is bracketed spatially. TCE remedial scenarios were not directly modeled and the TCE plume is addressed on a conceptual, performance-based level. EPA is proposing to collect additional confirmatory data on the TCE plume in the remedial design phase. Nonetheless, despite comparatively fewer available data, the necessary approach to the TCE plume is evident and supportable from the existing data, in large part due to the TCE plume's proximity to the benzene plume.

Why a TCE plume action is necessary. The data and information available would suggest that the TCE plume is more likely to move in response to changes in hydraulic conditions, such as pumping the chlorobenzene plume, than is the benzene plume. Laboratory and field studies would indicate that under most conditions TCE biodegrades at significantly lower rates than does benzene, which is proven to be highly and robustly biodegradable. The TCE plume appears to have moved farther from the apparent sources compared to benzene, despite the fact that the TCE

sources are likely to be younger than the Del Amo benzene sources.

Based on this higher potential to move in response to adding outside hydraulic influences to aquifers nearby the TCE, EPA believes that containment of the TCE will be necessary to prevent undesired movement. Because intrinsic biodegradation cannot be relied upon to obtain this containment, active hydraulic extraction of the TCE must be used.

Why Appropriate TCE Actions are Limited. While hydraulic extraction of the TCE plume is necessary, the manner in which it feasibly can be implemented is limited by its proximity to the high-concentration benzene and benzene NAPL. On this point, the following discussion addresses the MBFB Sand and MBFC Sand in turn.

In the MBFB Sand, the TCE plume is commingled with the high concentration benzene and NAPL in the benzene plume. Accordingly, attempting to pump and treat to remove the TCE from within the benzene plume would not a reasonable option, as it would imply pumping the high concentration benzene plume in the fine grained upper units, a prospect which does not further the goal of containment, and, consequently, was screened from further consideration.

In the MBFC Sand, the TCE plume lies directly *under* the benzene plume (and NAPL) in the MBFB Sand, and thus containing TCE in the MBFC Sand would imply hydraulic extraction under the MBFB Sand contamination at the former Del Amo plant. Because of the thin separation between the MBFB Sand and the MBFC Sand, this would move some contamination downward from the MBFB Sand to the MBFC Sand. As discussed above in Section 7, it would be feasible to contain the TCE by pumping in this way, as long as gradient controls were employed and only containment, not restoration to drinking water standards, was required. However, such extraction would have significant risks and implementation problems because of the benzene NAPL directly above the MBFC Sand being pumped. Based on existing data, EPA does not believe that hydraulic extraction directly under the benzene plume in the MBFB Sand is appropriate. If data collected in the remedial design phase indicates pumping of the MBFC Sand under the MBFB Sand NAPL zones is necessary, EPA could modify the proposed remedy to include such an action.

EPA's Proposal for the TCE Plume. Instead, EPA proposes to take an action for the TCE plume more consistent with the other proposed remedial actions in this proposed plan. In the cases in which NAPL is proposed to be contained by hydraulic pumping in this proposed plan, the extraction well or wells used to achieve the containment purposely have been located downgradient of the NAPL, rather than directly in the midst of or under the NAPL, so as to avoid inducing drawdown and moving the NAPL (and associated high dissolved concentrations of contaminant) downward. Similarly, while the TCE plume needs to be contained, EPA does not propose to contain the TCE plume by employing hydraulic extraction in the MBFC Sand directly

under the benzene NAPL in the MBFB Sand. Rather, EPA proposes to employ a performance-based approach requiring that the TCE, like the benzene, stay contained within the TI Waiver zone. As with the benzene, if the TCE were to move outside the TI waiver zone, hydraulic extraction would be employed to re-establish containment. Such extraction would not take place under the benzene NAPL, but at the periphery of the TI waiver zone, and thus risks of benzene movement would be minimized.

More specifically, EPA proposes:

1. The immediate sources of TCE contamination in the TCE plume (near solvent-using facilities upgradient of the MW-20 area) will be partially contained by pumping and treating groundwater at low rates near these sources. This pumping will not be directly under the benzene NAPL in the MBFB Sand, but will take place slightly upgradient of the NAPL. This hydraulic extraction will limit the highest concentrations of TCE, as well as TCE NAPL from migrating laterally and vertically.
2. Treated water from this hydraulic extraction will be re-injected back into the aquifer to obtain the optimum flushing and ability to limit hydraulic influences on the neighboring benzene NAPL.
3. Additional sampling during remedial design will confirm the exact size and nature of the TCE plume in the MBFC Sand for design purposes. If the data reveal unexpected information, adjustments to the remedy will be proposed and implemented by EPA, as necessary.
4. On a performance basis, TCE that is currently within the TI waiver zone (established as described earlier) will not be allowed to leave the zone. While hydraulic extraction of the TCE in the MBFC Sand directly under the benzene NAPL in the MBFB Sand is not proposed, additional pumping wells downgradient of the TI waiver zone and/or under the MBFC Sand in the Gage Aquifer may be required to meet this performance requirement.

As this approach to the TCE plume is a component of all alternatives (other than the No Action Alternative), it is not further described in the discussion that follows.

Table of Alternatives (2 pages)

-----FASTER CLEANUP----->					
	Alternative 1 "No Action"	Alternative 2	Alternative 3	Alternative 4	Alternative 5
CHLOROBENZENE PLUME					
Approximate rate of Hydraulic Extraction	No action	350 gallons per minute	350 gallons per minute	700 gallons per minute	1400 gallons per minute
Method of Hydraulically Isolating NAPL Area	No containment of the NAPL area	Extracting and treating the groundwater	Extracting and treating the groundwater	Extracting and treating the groundwater	Extracting and treating the groundwater
Where is the Treated Water Discharged?	No action, thus no discharge	Aquifer injection	Aquifer injection	Aquifer injection	Aquifer injection
BENZENE PLUME					
Approximate rate of Hydraulic Extraction	No action	No hydraulic extraction for benzene plume	Approximately 40 gallons per minute	Approximately 40 gallons per minute	Approximately 40 gallons per minute
Method of Hydraulically Containing Benzene Plume	No containment of the benzene plume	Rely on intrinsic biodegradation to contain the entire benzene plume	Contain the UBF and MBFB Sand with intrinsic biodegradation ----- Contain the MBFC Sand with extracting and treating the groundwater	Contain the UBF and MBFB Sand with intrinsic biodegradation ----- Contain the MBFC Sand with extracting and treating the groundwater	Contain the UBF and MBFB Sand with intrinsic biodegradation ----- Contain the MBFC Sand with extracting and treating the groundwater
Where is the Treated Water Discharged?	No action, so no discharge	No treated water to discharge	Storm Drain	Storm Drain	Storm Drain

	Alternative 1 "No Action"	Alternative 2	Alternative 3	Alternative 4	Alternative 5
TCE PLUME					
What is Done? (Same in all alternatives except #1)	No action	Extracting and treating groundwater to partially contain the sources; TCE is not allowed to spread beyond TI waiver zone	Extracting and treating groundwater to partially contain the sources; TCE is not allowed to spread beyond TI waiver zone	Extracting and treating groundwater to partially contain the sources; TCE is not allowed to spread beyond TI waiver zone	Extracting and treating groundwater to partially contain the sources; TCE is not allowed to spread beyond TI waiver zone
COSTS OF THE ALTERNATIVES†					
Total 30-Year Present Worth*:	\$0	\$20,843,000	\$25,971,000	\$29,981,000	\$39,871,000
Capital Cost:	\$0	\$11,959,000	\$13,533,000	\$15,586,000	\$21,611,000

 EPA's Preferred Alternative

*Costs are calculated as 30-year present worth, even though the true duration of the remedy is likely to be greater than 30 years. This is reasonable because the present worth value of the dollar after 30 years is small under a reasonable depreciation rate. For instance, EPA ran calculations which showed that if the cost basis were extended to 100 years, instead of 30 years, the total present worth value would increase by only about 12%, assuming a 5% depreciation rate. Because the true total time to cleanup cannot be known exactly (time frames for alternatives are compared on a relative, not absolute, basis) EPA believes that the 30-year present worth value is an acceptable estimate, and basis for comparison, of the total costs of the alternatives in this case

SECTION 10: Summary of Evaluation of Alternatives

Effect of Long Remedial Time Frames

The length of cleanup times has a significant effect on this alternative evaluation. The three plume reduction scenarios considered for the chlorobenzene plume differ in terms of the aggressiveness with which the plume is reduced. However, even at the fastest rate considered, the time needed for the volume of the chlorobenzene plume outside the TI waiver zone to shrink to zero is very long (in excess of 50 years). As discussed, modeling simulations of cleanup time frames can only be used on a relative, not absolute, basis (See Section 4). Because the time frame of the remedy is so long, there cannot be absolute certainty that the goals of the remedy will be met in the long term. However, the degree of uncertainty varies with the length of time the remedy would be expected to take. While all of the alternatives, except for the No Action Alternative, have the potential to meet the same remedial action objectives, EPA believes it would be misleading to represent that these alternatives are certain to attain, or have equal certainty of attaining drinking water standards 100 or more years into the future. Instead, EPA compares the alternatives with respect to the *degree* of certainty that, at the conclusion of the remedial action, drinking water standards will have been attained in the portion of the groundwater being restored, and that the remainder of the plume will be contained.

In general, in dealing with extensive time frames, the longer the time required for a remedial alternative to meet remedial action objectives, the greater is the uncertainty that it will ultimately meet those objectives. In addition, when more of the plume is removed relatively early in the remedial action process, there is greater certainty that the remedial objectives will be attained, particularly if the majority of the plume is removed within the range of time in which the model is a reasonable predictive tool.

The regulations for Superfund require that remedial actions attain ARARs (in this case, drinking water standards) in a reasonable time frame. In this case, EPA believes that an alternative should be considered more "reasonable" with respect to time frame if it restores a major portion of the aquifer to drinking water standards in a relatively more certain and short time frame, as compared to an alternative that restores very little of the aquifer until late in the long remedial action. EPA refers to this as the "early time performance" of the alternative.

These concepts are crucial to EPA's evaluation of the alternatives for this proposed remedy. The JGWFS (Chapter 10) provides much more detail and discussion about the nature of the uncertainties associated with long time remedial time frames.

The cost estimates in the following discussion are based on the JGWFS and are approximate values intended to be within +50%/-30% of the actual values.

Alternative 1: No action would be taken, and no monitoring would occur. Contamination would continue to move unchecked and unmonitored. NAPL would continue to contaminate groundwater. Potential health risks, if realized, would not be abated. Existing groundwater contamination would remain indefinitely, on the order of several centuries, and would potentially continue to impact new areas. Alternative 1 would not be protective of human health and the environment in the long term, and would not meet ARARs. It also would not reduce the mobility, toxicity or volume of contaminants, and by definition includes no treatment. There is no direct cost associated with this alternative. Alternative 1 ranks the lowest with respect to all of the NCP criteria, except for cost.

Alternative 2: Alternative 2 has the potential to be protective of human health and to meet ARARs, but because the hydraulic extraction rate of 350 gpm for the chlorobenzene plume is low, the time to complete the remedy is the longest of any of the alternatives (excluding No Action, in which a cleanup is never completed). After 25 years, the model predicts that somewhat less than one third of the volume of the chlorobenzene plume (with concentrations above drinking water standards) would be removed.

Pore volume flushing is a measure of the total number of times the volume of water in the interstitial pores in the soil will be exchanged per unit time through a hydraulic extraction system. Pore volume flushing is critical to the effectiveness of such a system because it is the flushing that enhances removal of dissolved contaminants from the soil. The area with measurable pore volume flushing under Alternative 2 is limited to one half the size of the chlorobenzene plume and coverage is sporadic. This reduces its effectiveness in the short term, and increases the uncertainty that it will be effective in the long-term and will attain ARARs.

Alternative 2 would stop the chlorobenzene plume from spreading and gradually reduce its size. Because of the exceptionally long time frame of the cleanup under Alternative 2, and the poor early time performance, particularly in the first 25 years, there is again greater uncertainty that drinking water standards would ultimately be attained, and that the remedy would become fully protective, in the long term, relative to alternatives with higher chlorobenzene pumping and performance rates. The ability to reduce mobility, toxicity and volume of contaminants is less in this alternative than in other alternatives.

Alternative 2 relies on intrinsic biodegradation entirely to contain the benzene plume. There is significant uncertainty as to whether intrinsic biodegradation will reliably contain the benzene plume in the MBFC Sand, once the pumping of the chlorobenzene plume starts. This is because pumping the chlorobenzene plume could pull on the benzene in this layer and may move it. Alternative 2 is the easiest to implement of the alternatives other than Alternative 1, No Action.

The cost of Alternative 2 would be \$20,843,000.

Alternative 3: Alternative 3 has all of the same qualities as Alternative 2 with respect to the chlorobenzene plume, but rather than relying on intrinsic biodegradation to contain the entire benzene plume, it uses active hydraulic extraction and treatment to contain the benzene plume in the MBFC Sand. In the JGWFS, this scenario was called "**Hybrid Containment**" because it achieves containment of the benzene plume by two methods. Because intrinsic biodegradation is merely a pre-existing condition in the soil, it cannot be controlled. However, hydraulic extraction and treatment can be designed and controlled directly to provide better, adjustable, and more reliable control of the possible movement of benzene in the MBFC Sand. This increases the certainty that the benzene plume will remain contained and will not move downward or sideways when chlorobenzene pumping is started. Therefore, Alternative 3 has better certainty of long-term effectiveness and meeting ARARs in the long term, and therefore of long term protectiveness. Alternative 3 presents a few more implementability issues than does Alternative 2, because a separate system must be built and designed to implement the pumping and treatment of the MBFC Sand. However, Alternative 3 is still highly implementable.

The cost of Alternative 3 would be \$25,971,000.

Alternative 4: Alternative 4 includes hydraulic extraction of the chlorobenzene plume at 700 gpm, as opposed to 350 gpm as in Alternatives 2 and 3. Alternative 4 would stop the chlorobenzene plume from spreading almost immediately and begin to reduce its size. The increase in the pump rate means that much more of the plume is removed earlier, and that the overall cleanup time would be less. Thus, Alternative 4 is better than Alternatives 2 and 3 both in terms of early time performance and total time to cleanup. At 25 years, the model predicts that slightly more than two-thirds of the chlorobenzene plume would be removed. Also, the pore volume flushing by this Alternative is greater and more efficient, covering the entire chlorobenzene plume more completely and evenly. This means the alternative has a greater ability to remove contamination. Alternative 4 has greater short- and long- term effectiveness than Alternative 3. There would be a greater certainty that the drinking water standards would be achieved and that the remedy would ultimately be protective in the long term. Alternative 4 also has a greater ability to reduce the mobility, toxicity and volume of contaminants in a shorter time. Alternative 4 is the same as Alternative 3 with respect to the benzene plume.

Alternative 4 would be somewhat more difficult to implement compared to Alternative 3 due to the greater number of extraction wells and equipment required. However, Alternative 4 is still highly implementable.

The cost of Alternative 4 would be \$ 29,981,000.

Alternative 5: Alternative 5 includes pumping and treating of the chlorobenzene plume at 1400 gpm as opposed to 700 gpm in Alternative 4. This further increase in the pump rate means that still more of the plume is removed earlier, and the overall cleanup time would be less. At 25 years, the model predicts that 90% of the chlorobenzene plume would be removed (however, as discussed, the real time for cleanup is likely to be more than that predicted by the model, for all alternatives). The pore volume flushing under this alternative is greater than under Alternative 4 and covers the entire chlorobenzene plume. This results in greater short- and long-term effectiveness. Alternative 5 provides the greatest certainty that drinking water standards will be attained and that the remedy will be protective of human health in the long term. Alternative 5 provides the greatest reduction in mobility, toxicity and volume of contaminants in the shortest time.

Alternative 5 is somewhat more difficult to implement than Alternative 4 due to the greater number of extraction wells and equipment required. Also, there can be difficulties with injecting water into the aquifer which may become more apparent at the higher pump rate in this alternative. However, Alternative 5 is still implementable. Alternative 5 is the same as Alternative 3 with respect to the benzene plume.

It is noted that, while Alternative 5 was the most aggressive alternative considered, 1400 gpm does not represent an extreme pump rate from the standpoint of performance or in terms of implementability limitations for reinjection.

The cost of Alternative 5 would be \$39,871,000.

SECTION 11: Rationale for EPA's Preferred Alternative

It is noted that the rationale for the aspects of the proposed TI Waiver Zone were provided in Section 7. Also, the rationale for the approach to the TCE plume was provided in Section 9.

As discussed in earlier sections, the groundwater, should it ever be used, would present an extreme risk and a principal threat. Because the groundwater continues to move, new portions of the resource can become impacted by contamination in the future. The NAPL itself serves as a principal threat which continues to contaminate groundwater. Finally, the regulations direct EPA to restore this groundwater to drinking water standards where it is practicable to do so (i.e. these standards are ARARs where not waived). The approach EPA is proposing to remedy the groundwater at the joint site removes these principal threats, meets ARARs where practicable, and safely contains contamination with a significant degree of certainty where it is not practicable to meet ARARs.

All of the alternatives considered, except for Alternative 1, No Action, imply the presence of a hydraulic containment zone for NAPL for an indefinite duration, perhaps centuries. Such time frames are far beyond our present capabilities to model or anticipate. While not losing sight of cost effectiveness, EPA has placed a premium of value on actions that will reduce the long-term uncertainty in the remedy. It is difficult to assess whether, for instance, EPA or the responsible parties will exist in 500 years to ensure the remedy remains effective and protective. It is true that presently it is not possible to clean all groundwater at the joint site to drinking water standards. While this must be accepted, it is for the same reason appropriate to deal with long-term uncertainties conservatively. In many ways which are discussed in the JGWFS, the duration of the remedial action is directly related to the uncertainty as to its success. Therefore, when more of the plume is removed early, less of the plume remains subject to large long-term uncertainties. This means it is appropriate to value the alternatives which provide early time performance and take less time to implement. Likewise, alternatives with more certainty of maintaining reliable containment of the NAPL zones are favored by EPA over those providing less certainty, because the containment must be in place and effective for such a long time.

EPA proposes to implement *Alternative 4*, referred to in the JGWFS as *Benzene Hybrid Containment / Chlorobenzene Plume Reduction 2 (700 gpm)*, because it is an appropriate balance between performance and practicability, and also long-term certainty and cost.

Alternative 4 (as well as 2, 3 and 5) hydraulically isolates the NAPL so that the largest reasonable portion of the contaminated groundwater can be restored to drinking water standards and to limit the potential for human exposure to contaminated groundwater. They also arrest the further lateral and vertical movement of all plumes. Finally, they also assume that NAPL recovery actions (as determined appropriate in a second phase and subsequent ROD amendment) are implemented to reduce the potential for NAPL mobility and ensure greater long-term effectiveness. These basic actions are necessary and appropriate to address the overall groundwater problem at the joint site.

While addressing NAPL isolation (both by hydraulic containment and by intrinsic biodegradation), Alternative 4 (as well as 2, 3, and 5) also mitigates drawdowns and reduction in interstitial pore pressures in the NAPL zone, which may induce NAPL to migrate downward. The issues of NAPL movement and the inducement of movement of one plume due to actions focused on another plume, have been addressed and modeled in detail by the feasibility study. Therefore, all alternatives other than the No Action Alternative (including Alternative 4) strike a good balance between remediating the contamination and avoiding situations which might make the contamination worse.

Finally, as discussed, EPA assumes for the purposes of this analysis that NAPL is recovered (removed) from these sites to the extent determined appropriate by a separate action. This NAPL

removal has the potential to limit the degree to which the NAPL can move, increasing the long-term certainty of effectiveness of this proposed groundwater remedy.

Rationale for Chlorobenzene Plume

With respect to the chlorobenzene plume, Alternative 4 provides greater and better-distributed pore volume flushing, stronger early time performance, and a shorter overall cleanup time as compared to Alternatives 2 and 3. The model predicts a significant majority of the plume is gone in the first 25 years (though it is highly likely that the model underestimates cleanup times, as discussed). This means overall uncertainties of long-term remedy performance and of meeting the remedial action objectives are lower, including ultimate attainment of drinking water standards. While the performance of Alternative 4 is markedly superior to that of Alternatives 2 and 3, the cost of Alternative 4 is only \$4 million more than the cost of Alternative 3. EPA therefore favors Alternative 4 over Alternatives 2 and 3 for the reasons discussed at the beginning of this section.

The performance of Alternative 5 is clearly superior to that of Alternative 4. The model predicts that almost all of the chlorobenzene plume is removed in 25 years. The pore volume flushing rates are higher with Alternative 5, and roughly as well distributed spatially as with Alternative 4. However, Alternative 5 costs \$10 million more than Alternative 4, and the relative increase in performance is less than the increase of Alternative 4 over Alternative 3. In addition, Alternative 5 poses some issues with implementability which would likely be of lesser prominence than with Alternative 4. While EPA does not believe these issues would be insurmountable, it is possible that the true costs of Alternative 5 could be higher in dealing with such issues (e.g. plugging of re-injection wells at higher injection rates).

EPA proposes to specify not only that the chlorobenzene plume be constructed and operated at approximately 700 gpm, but that it be designed to remove 50% of the plume in 15 years, 70% of the plume in 25 years, and 99% of the plume in 50 years, as measured by a refined computer model during the remedial design phase of the remedial action, and that progress toward these targets be monitored during the course of the remedial action. It is recognized that the model will not predict actual cleanup times, but progress can be tracked on a relative basis.

Rationale for the Benzene Plume

Alternative 4 (as do Alternatives 3 and 5) contains hybrid containment for the benzene plume, which means that biodegradation is relied upon for the UBF and the MBFB Sand, but that the benzene in the MBFC Sand is contained by active hydraulic extraction. This is an appropriate balance between cost and long-term certainty of containing the benzene plume. The UBF and the MBFB Sand are fine-grained units in which the groundwater flow velocities are very low. While they are classified as drinking water units, their relatively low ambient water quality, low water-

producing potential, and small aquifer thickness make them less-likely candidates for actual groundwater use. There is strong evidence for biodegradation and a relatively stable benzene plume in these units under natural conditions. The risk of a failure of intrinsic biodegradation to contain the benzene plume in these units is relatively low. It is appropriate to rely on intrinsic biodegradation in this case, so long as contingent active hydraulic extraction is also required in the event that intrinsic biodegradation fails to keep the benzene plume contained. EPA proposes to apply these contingencies as part of this proposed remedy.

The MBFC Sand is different for several reasons, however. First, the MBFC Sand has much higher hydraulic conductivities and, is thicker (and therefore much more transmissive) than the UBF or the MBFB Sand. Accordingly, groundwater velocities are higher and there is more chance of adverse migration in this hydrostratigraphic unit. Moreover, the MBFC Sand is a somewhat more likely candidate for groundwater use compared to the MBFB Sand. The Lower Bellflower Aquitard (LBF), which cannot be effectively monitored, lies directly below the MBFC Sand. Below the LBF lies the Gage Aquifer, which is a better candidate for future groundwater use. Should containment of the benzene plume in the MBFC Sand fail in the future, benzene could transgress the LBF and this would not be noticed until the benzene arrived in the Gage Aquifer. At this point, the relative benefit of having the fine-grained LBF serve as a buffer between the contamination in the upper units and the Gage Aquifer could be permanently lost.

The modeling simulations resulted in small movements of benzene toward the chlorobenzene plume under the various pumping rates for chlorobenzene which were simulated. This simulated movement was slight, however it is precisely in the area least desirable for benzene movement. Benzene at this location would be entering the chlorobenzene plume and possibly moving downward into the Gage Aquifer.

Also, there is more modeling uncertainty associated with the transport of contamination in the MBFB Sand than in the MBFC Sand, and the modeling of the transport of contaminants from the MBFC Sand vertically into the Gage Aquifer must be considered highly uncertain. As with all models, local heterogeneities cannot be accounted for. Therefore, it must be assumed that more benzene migration, either laterally or vertically, could occur than the model predicts. EPA believes that the modeling uncertainties and the higher risk factors associated with the MBFC Sand combine to make reliance on intrinsic biodegradation to contain the benzene plume for the MBFC Sand risky. It is for this reason that EPA screened out alternatives which relied on intrinsic biodegradation for the MBFC Sand at the higher 700 and 1400 gpm pump rates for chlorobenzene. For the same reasons, EPA believes that Alternative 2 presents a risk which is not warranted given the relatively small additional cost of active hydraulic containment of the MBFC Sand and therefore prefers Alternatives 3, 4 and 5 to Alternative 2 with respect to this issue.

Alternative 4 contains active hydraulic containment of the MBFC Sand, which can be designed and manipulated to provide the maximum hydraulic control and therefore the maximum certainty in the long term that the benzene plume will remain contained. It is noted that it is much easier and far less costly to establish containment by hydraulic extraction in the MBFC Sand, than in the fine-grained MBFB Sand or the UBF.

Proposal for p-CBSA

EPA proposes to apply a limit of 25,000 ppb on the concentration at which p-CBSA can be re-injected into the ground. This is based on a State To-Be-Considered criterion, which is non-promulgated. EPA does not currently propose to capture or shrink the area affected by p-CBSA contamination at this time. EPA proposes to monitor p-CBSA movement as part of this remedy. Modeling suggests that, under Alternative 4 over time, the p-CBSA spreads out due to aquifer injection over a somewhat larger area and is diluted in the center. After 50 years, concentrations average 1000-5000 ppb over the entire distribution of p-CBSA. At the Superfund 5 year reviews required by law, EPA will re-evaluate whether additional toxicological studies have been performed for p-CBSA, assess the extent of the p-CBSA plume and make determinations as to whether the remedy remains protective with respect to p-CBSA.

Finalizing of the Del Amo Waste Pits ROD

On September 5, 1997, EPA issued a ROD for the Del Amo Waste pits. This ROD specified that the cleanup goals for soils under the waste pits were to be considered interim pending a decision by EPA on the groundwater. In this proposal, EPA proposes a TI waiver zone which includes the groundwater under the waste pits. This means that the water under the waste pits would not be restored to drinking water standards. EPA believes, therefore, that the currently-existing soil standards in the Del Amo Waste Pits ROD will be sufficient to prevent significant additional contamination from entering the groundwater at that location, and will allow for groundwater remedial action objectives to be satisfied.

The interim soil standards in the Waste Pits ROD were not based on cleaning soil under the waste pits so as to achieve drinking water standards in groundwater. Rather, the interim soil standards were set to provide a level of protection that was on the order of 2500 times less stringent. The goal of the interim standards was to ensure that any additional contamination coming from the waste pits in the future would be small relative to the existing contamination already in the groundwater. In effect, this was to control the waste pits as a major source of additional contamination.

While this proposed remedy would place the waste pits in a TI waiver zone, EPA believes it is still prudent to limit the amount of additional contamination that can be added by the waste pits to the groundwater system. The TI waiver waives the requirement to clean groundwater to

drinking water standards, but it does not preclude reasonable and appropriate source control measures to ensure that large quantities of additional contamination, NAPL or otherwise, do not arrive in the groundwater. The interim standards were set based on this goal. Accordingly, EPA proposes to make final the soil standards for the Del Amo waste pits as they currently exist in the Waste Pits ROD.

Opportunities for Public Involvement

Although EPA attempts to weigh all reasonable considerations when proposing a preferred remedy, it is not always possible for us to know about all the community's concerns. EPA invites your participation in selecting a groundwater cleanup remedy for the Del Amo and Montrose Superfund Sites. There are a number of ways you can become involved. EPA will hold a public meeting regarding this proposed plan, in which EPA will explain the proposed plan, discuss the sites, and answer questions. The date, time, location, and nature of this meeting are discussed in EPA's general fact sheet version of the proposed plan, which serves as EPA's announcement of the meeting.

You may send written comments on this proposed plan, within the public comment period, to:

Jeff Dhont
SFD-7-1
U.S. EPA Region IX
75 Hawthorne Street
San Francisco, CA 95105

Requests for extensions of the comment period should be sent to the same address. Please note there is a deadline for submission of such requests which appears in EPA's general fact sheet version of the proposed plan.

To learn more, you may find an extensive amount of information at EPA's information repositories at the Torrance or Carson public libraries. These repositories contain the documents that EPA used to evaluate alternatives and identify its proposed remedy, called the Administrative Record. The administrative record is housed in the libraries on microfilm. However, selected critical documents are also available in hard copy. The Administrative Record is also available at EPA's Region IX Offices in San Francisco.

If you would like more information or have questions about activities at the Del Amo or Montrose sites, or if you did not receive this fact sheet in the mail and would like to receive future fact sheets, please contact the following people:

Jeff Dhont
Remedial Project Manager
U.S. EPA Region IX
(415) 744-2399

Andrew Bain
Community Involvement Coordinator
U.S. EPA Region IX
(415) 744-2186

A message also may be left for Andrew Bain by calling the Community Involvement toll free line at 800-231-3075.